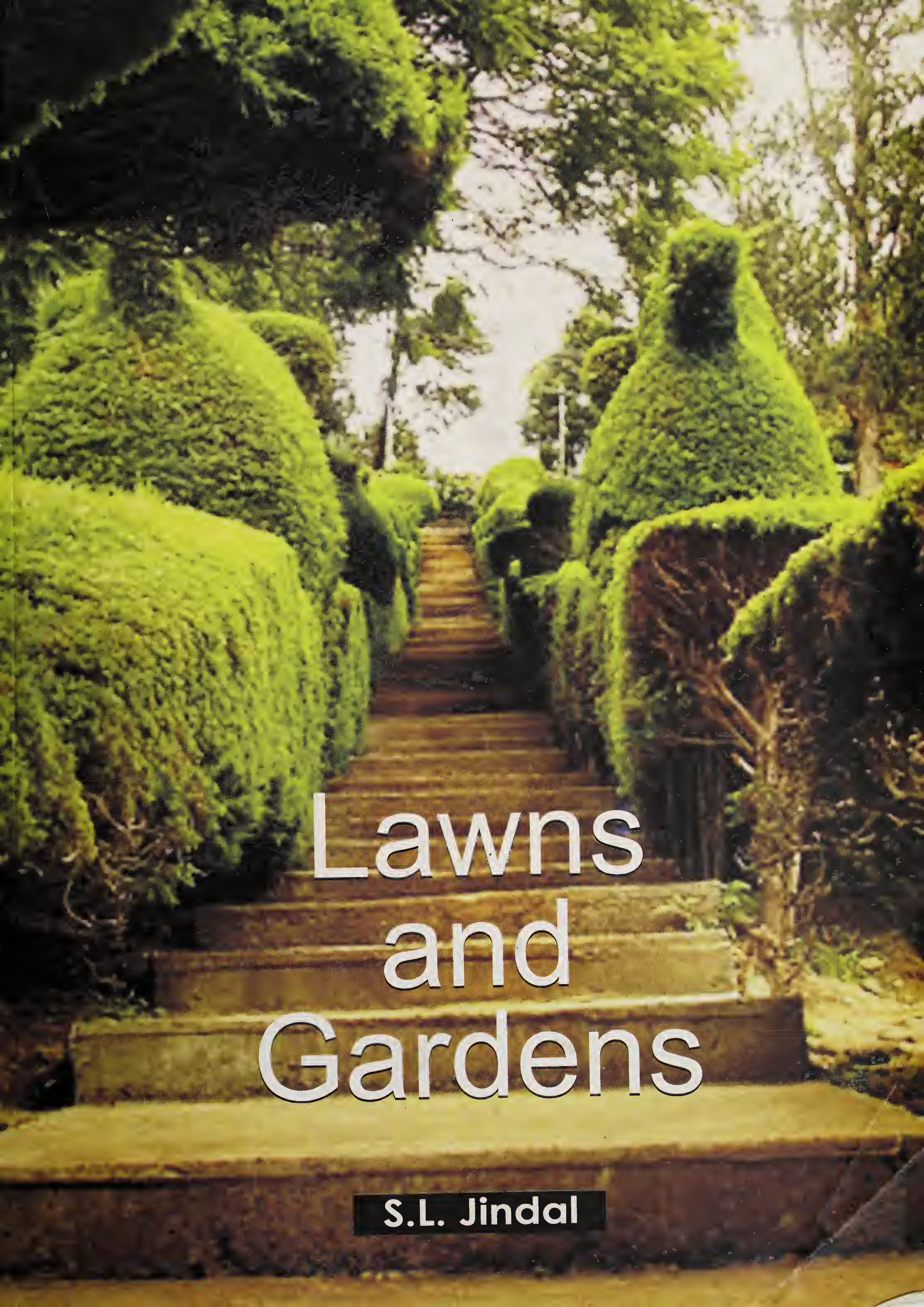

Lawns and Gardens

S.L. Jindal

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S. L. JINDAL

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Preface

This is a book meant for the gardening enthusiast written at the request of readers of my Gardening column in various newspapers. As a professional in Landscape Gardening and Horticulture of many years' standing, my endeavour is to help them in laying out a quiet "nook" for themselves.

Not meant to be an encyclopedia on gardening, this volume has been planned only to present, in a simple style, a few clues to gardening.

Aesthetics apart, gardening, through the cultivation of vegetables and fruits, can also be a source of income. Not absolutely lost in gardening for pleasure, some hints on vegetable and fruit-gardening have also been added to this book.

On the joys of gardening, I can do no better than to repeat the words of Tennyson which come to my mind :

"Come into the garden, Maud,
For the black bat, night, has flown
Come into the garden, Maud,
I am here at the gate alone;
And the woodbine spices are wafted abroad,
And the musk of the rose is blown".

And William Morris adds :

"I know a little garden dose
Set thick with lily and red rose
Where I would wander if I might
From dewy dawn to dewy night ..."

And then, when Ogden Nash feigns ignorance, he but avers the pleasures of gardening :

"My garden will never make me famous,
I'm a hort—ignoramous
I can't tell a stringbean from a soy-bean
Or even a girl-bean from a boy-bean.

As a lover of nature, I am vain enough to assume that the garden has been the fountainhead of inspiration for these and many other Masters of the Muse.

S.L. Jindal

Introduction

'Once a gardener, always a gardener' refers to the many pleasures and compensations of gardening. A garden is all things to all men. To the large majority, it is a quiet corner to relax in or entertain. Others avidly raise vegetables and fruits. Yet others, fortunately only a few, complain of the backache they get.

Gardening may be for pleasure or for profit, or for both. For pleasure, one can plan an ornamental or landscape garden and for profit a vegetable or a fruit garden. The design of a garden will depend on the purpose for which a garden is wanted.

Except in the vast countryside, limitation of space is a crucial factor. Vegetation has therefore to be tamed to meet man's requirements and aesthetic tastes.

Perfect harmony with environment should be the keynote of a garden, particularly a pleasure garden. Broadly speaking, a garden should have three characteristics : naturalness, symmetry or asymmetry and the drawing together of natural and architectural features. The overall design would provide for the location of various plants and features at proper places. The design could be modified to cater to the inclinations of the individual gardener.

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I

Creating a Pleasure Garden

A GARDEN PUTS one in communion with nature. In creating a pleasure garden, one sees a place to relax mind and body in. In this process, the stresses and strains of everyday life are eased.

Besides, a good garden provides the locale for an intimate get-together with one's family and friends.

There is sufficient need in India for having recourse to a pleasure garden, particularly in the plains, for the warm season lasts seven to eight months.

The designing of a garden depends on several factors. Generally, it should be so laid out as to be a part of the house in schemes of home gardening. It should serve the purpose of an outdoor house.

Subject to space being available, a lawn is an essential feature of any garden. If sufficiently long and wide, a portion of it can be converted into an outdoor playground.

A garden can be used both in day time and at night. Particularly in the warm regions, moonlit night gardens can be laid out.

Pleasure Garden

How do we set about laying a pleasure garden? It requires a large measure of planning and skill. A garden needs to be blended artistically imparting colour and naturalness to the scene. Imagination and creativity, are necessary. The general practice is that 25 per cent of the area is reserved for flowers and plants and the remaining 75 per cent is for open area and other features.

What are the pre-requisites of a good garden?

Good garden land and a steady source of good water are essential for successfully raising any garden be it landscape or ornamental, vegetable or fruit.

Soil and water tests are imperative before a garden can be laid out. The plant must be provided as ideal a condition as possible for its proper growth.

The importance of good water for a garden cannot be underrated. In some cases, water from a tube-well also could be unfit for this purpose. Without a supply of unfiltered or filtered water, laying a good garden is not possible.

After soil and water testing, the soil has to be prepared. A point that should be noted is the type of manurial treatment that is necessary. This will be related to the use to which the garden is to be put and the type of plants that are to be grown.

Soil deficiency in certain respects can also be overcome. This is done by adding manures and chemical fertilisers which increase soil fertility. You can thus grow your flowers or other plants. Alternatively, if the soil is deficient in certain minerals or is excessively alkaline or acidic, certain types of plants can be selected which will grow there despite these deficiencies.

Fencing

Prior to soil preparation it is desirable to provide an enclosure around the selected site. This will protect it from trespass by cattle or human beings. The gate at the main entrance of' the enclosure or at least its components should be artistic and elegant. If the gate is inartistically designed, the unfavourable impression initially gained by a visitor will persist however beautifully a garden is laid out.

In putting up fencing and gates, the key-note should be simplicity with emphasis on artistry and aesthetic beauty. The colour scheme should be pleasing. A gaudy combination of colours will detract from the soothing effect that a well laid-out garden is designed to produce.

Low walls of stones, bricks or pebbles could be raised in different patterns around the perimeter. Topped over with a railing of steel in design or a "jaali", it would be more presentable than a solid block of masonry wall. For several hours a day, inside the house, in the office or in a factory or work-place, an individual is surrounded by bricks and masonry. A low-walled garden provides relief by breaking this monotony.

There are alternatives for those who find it difficult to go in for costly fencing or gates. Barbed wire, or angle-irons can be used in alluring patterns and pleasing colour schemes. By planting shrubby climbers like bouganvilleas around such a fencing, it can be covered completely with an evergreen screen capable of presenting a galaxy of colours. The flowers in this screen bloom for over four months a year in tropical and sub-tropical regions. Other shrubs or rose climbers can also be used for this purpose for temperate regions.

Gates can be designed by using materials like wood, bamboo, angle-irons, iron-bars and wire-netting. The setting created by this treatment will be more natural, resembling either the Japanese way of creating a garden or western.

Certain circumstances warrant the construction of a wall. In these cases, however, the material used in building the Wall, specially its outside face, matters the most. The inside face can be covered by a variety of climbers, shrubs or hedges.

The external face, open to view from the outside or to the visitor entering the garden, should be designed in an impressive way.

The effort should be to evolve a pleasing pattern which is in harmony with the surroundings and the overall scheme of the garden.

Garden Paths

Garden paths are needed for facilitating approach to any portion of the garden without trampling the grass or injuring or breaking the flowering plants placed along the passages .

Garden paths also introduce an element of contrast in a garden scheme. If the materials used for the pathway construction are placed in an artistic pattern, the air of aesthetic beauty thus created attracts visitors to the garden. The passage itself possesses a lure which draws the individual towards it, making him walk over it. Well-planned pathways induce the onlooker to pace the garden leisurely. This is the essence of a well-planned path in a modem garden.

Garden paths should neither be too wide nor too narrow. They may run straight or take a serpentine course depending upon the general layout of the area. In a formal garden, the emphasis is on straight paths whereas in an informal garden it is on meandering passages which thereby impart a feeling of vastness to the garden.

Privacy

An ideal home garden provides privacy so that one can relax alone or with one's family or friends. Such privacy can be achieved by an intelligent placement of plants.

Privacy can be easily ensured in single storeyed houses. The designers should plant tall hedges or shrubs between homes. Between the house and the road, medium tall evergreen flowering climbers or shrubs can serve very effectively as screens. Available for these purposes are many varieties of evergreen and flowring hedge-plants and shrubs and climbers.

In multi-storied building areas, it is advisable to plant a few tall and medium-sized trees in irregular clumps. These clumps should be between the building and the road-side or neighbour's hedges. These trees form "pyramids" or canopies of greenery and provide privacy in the garden below by obstructing the view from the apartments above.

After treating the garden land for obtaining privacy, sites should be selected for planting flowering or shady trees and shrubs in order to make the garden colourful. There is a large variety of flowering trees-evergreen and deciduous-and shady trees and flowering shrubs which are evergreen or shed off their leaves. There are shrubs which bear colourful leaves throughout the year or whose foliage produces beautiful tints in autumn or other periods of the season. Similarly, there is no dearth of exquisite flowering climbers which can be used effectively for covering the walls of peragolas or for concealing some unsightly objects from view. Drab surroundings can thus be converted into colourful spots.

After planting trees and hedges for privacy comes the question of treating the open area in relation to the environment of the home.

Garden Lay out

The type of layout of a garden depends on the preference of the owner and the topography of the land. The formal layout which owes its origin to the Mughal art of laying out gardens and to the Hindu temple garden has been in fashion for a long time. The modern trend, however, is shifting towards laying out garden in an informal style. The latter provides ample opportunity to the designer to play with stones, rocks and waterfalls in a variety of interesting ways. Waterfalls, rivulets, rock compositions, undulations and mounds, can be created. Dexterous treatment of the open area meant for lawns and plantations with trees, shrubs and a variety of other flowering and evergreen plants will combine to create a real scene of beauty.

The layout should be such that it should infuse harmony between the building and the main garden.

Hard lines of a building are softened by planting clumps of clipped bushes intermixed with tall shrubs and dwarf and medium-sized trees. Dwarf shrubs and other plants placed along the wall below the drawing-room window will create a soothing effect.

In Japan, excellent use is made of plants like Maple, the foliage of which turns red during spring or autumn or during both the seasons. The plant is trained into artistic shapes enabling its arching angles and foliage to be seen in their grandeur through the glass windows of the drawing room. Through a paved walk possessing pleasing curves, one finds entrance from the house to the main garden.

For plantings made close to the wall of the drawing-room or some other situation, water-proofing is necessary. Water-proofing should be done of at least a 15 cm wide piece of land between the wall line and the line of the vegetation bed. Water-proofing is also to be done below ground to the depth of the foundation. This is to prevent damage to the house.

Garden Components

A beautiful garden can be developed in several different ways. Besides plants, some structural components, described below, add to the charm of a garden.

These components include rockeries, edgings, sitting places, fountains, waterfalls and ponds, cottages and pergolas, lighting equipment and moon-lit night equipment.

Rockeries, small or big, depending on the size of a garden, make an interesting addition to the landscape. Their effect will depend on the types of the stones and rocks selected and the proportion given to the settings. Place can be found in rockeries for cacti and a variety of other rock plants including ferns. The slopes of the mounds of the rockeries can be covered by some trailing plants capable of producing an evergreen cover. These slopes can also be covered with flowering plants which produce flushes of flowers either intermittently throughout the year or in certain specific seasons.

Edgings

Low edgings should be provided to the front line of mixed borders, herbaceous borders, and along garden paths. Mild steel bars, wood, cement-sheets, pebbles, bricks, tiles or stones, low annuals, low shrubs and dwarf perennials can be used for this purpose. Edgings make the area look more conspicuous. Many an alluring designs can be tried.

Sitting Spaces

Seats can be placed at suitable spots for relaxing in a garden. Stone-made chairs and tables fit in better in the scheme of a garden rather than furniture made of material suitable for a drawing-room. Irregular-shaped stones with smooth tops can be put to good use. Cut-pieces of tree trunks whose wood is resistant to white ants and is of lasting quality is cheaper than stones. Besides it satisfies the test of “naturalness”.

Fountains and Waterfalls

Water is the life and soul of any scheme of gardening, be it Hindu temple gardens, Mughal gardens, Western style gardens or Japanese style gardens. If the layout is formal, fountains can be provided depending on the space available. If the garden is designed informally, a small waterfall with a pond can be created. Water lilies and acquatic plants can be grown in lily ponds. A variety of designs and patterns can be fashioned in fountains, ponds, waterfalls and lily ponds.

Pergola

A small cottage or a hut or a peragola in a formal or informal garden enables one to enjoy the pleasures of a garden in the midst of rain or in extreme heat. Seated in the cottage, one can observe the pelting rain weave strange patterns on the vegetation outside.

The inside of the cottage or pergola can be brightened up by placing coloured foliage decorative plas. Grapevines can be trained over the cottage in sunny areas while other climbers, can be grown in shady locations.

Canopies and shelters serve a similar purpose. Material "rustic" in appearance can be used in their construction to fit in with the landscape. Garden furniture may also be made of the same material.

Lights

Light fittings make a garden more accessible. Lights are particularly needed when parties are to be held at night in the lawns. Subdued lights are helpful in the long summer evenings when one likes to sit outside.

The lighting arrangements should not disturb the tranquility of a garden. We often see long posts with bulbs protruding and throwing their glare around. Subdued or diffused lighting creates a soothing effect.

Some lanterns of the type used by the Japanese in their gardens and parks can be constructed. These can be of different designs and sizes suited to particular situations.

Moonlit Night Gardens

In warm regions, a moonlit night garden can be introduced making it equally attractive at night time. The emphasis should be on the inclusion of night bloomers and plants whose characteristic is to exude fragrance at night time. Provision might be made simultaneously for such items as white flowering trees, shrubs, bulbous, rhizomatous and tuberous, rooted plants, and perennials or annuals. In the water lily plants, night-blooming water lilies or lotuses could be planted.

Selection of Plants

The selection of a proper type of plant for a particular situation is very necessary. There may be spots bathed in full sun, spots where partial shade and sun are available for most part of the day, and spots where the sun does not reach at all. The selection of suitable plants which would flourish in a particular situation is of importance in any garden scheme.

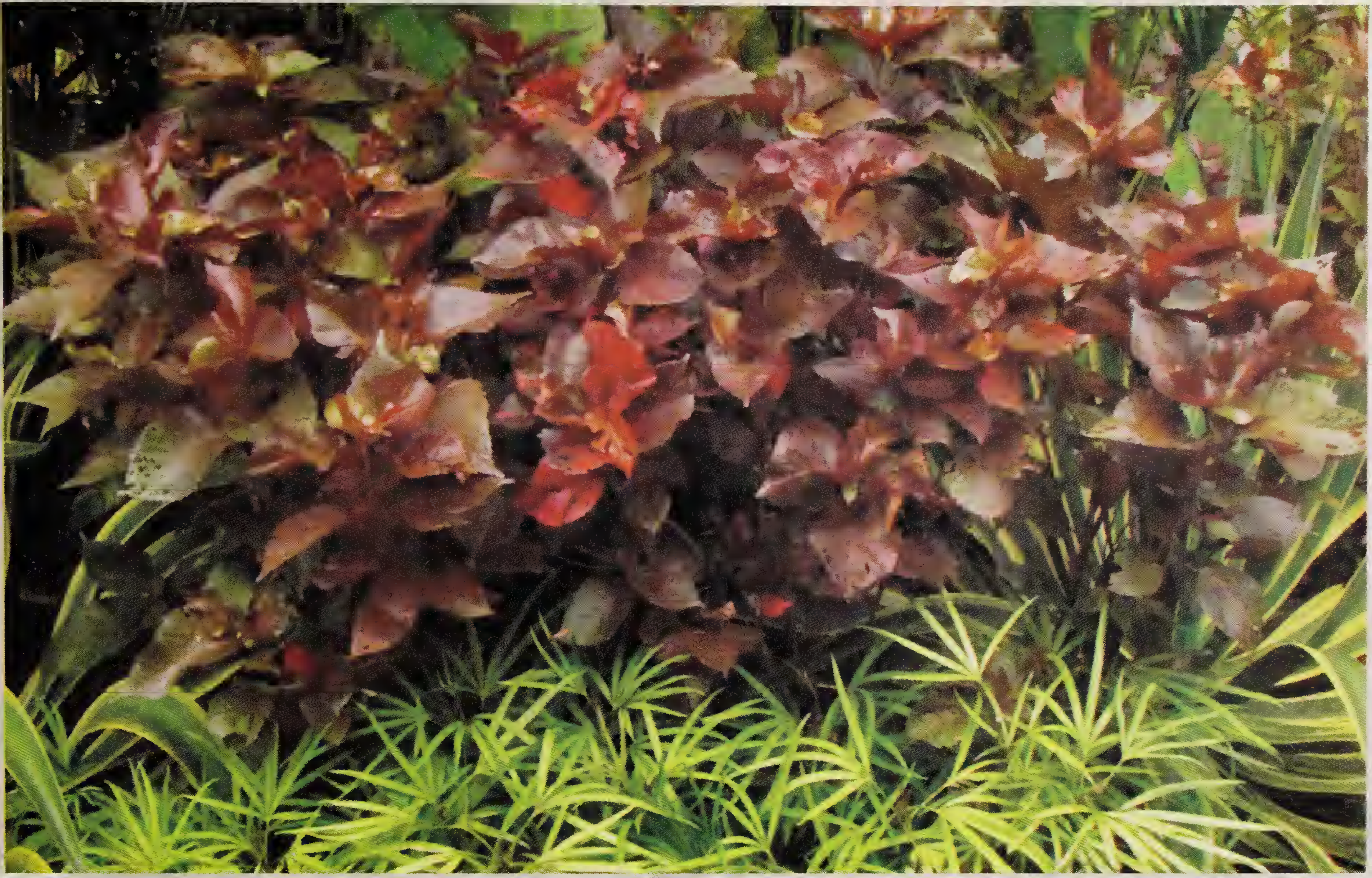
Plants should be selected with due regard to the soil and temperature, exposure to the sun and air and humidity and dryness at different periods of the year.

Planting of evergreen or flowering plants will require concentration at some spots. At other places, openness accompanied by the planting of a few dot plants intercepted by rock compositions is needed. It is absolutely essential that the overall scheme should create a pleasing scenery.

Saraca Asoca

A Grouping of Plants

Delonix Regia



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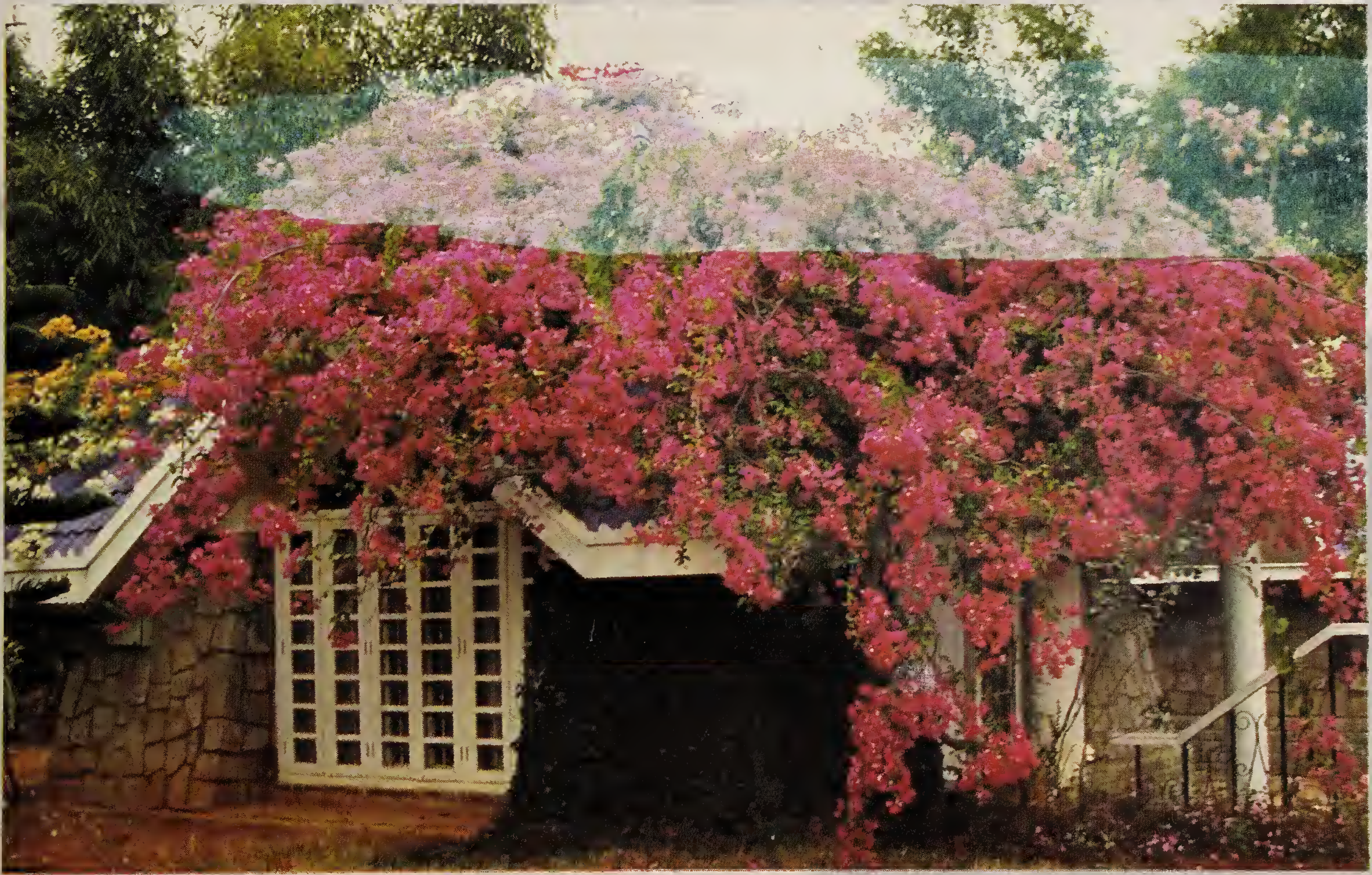
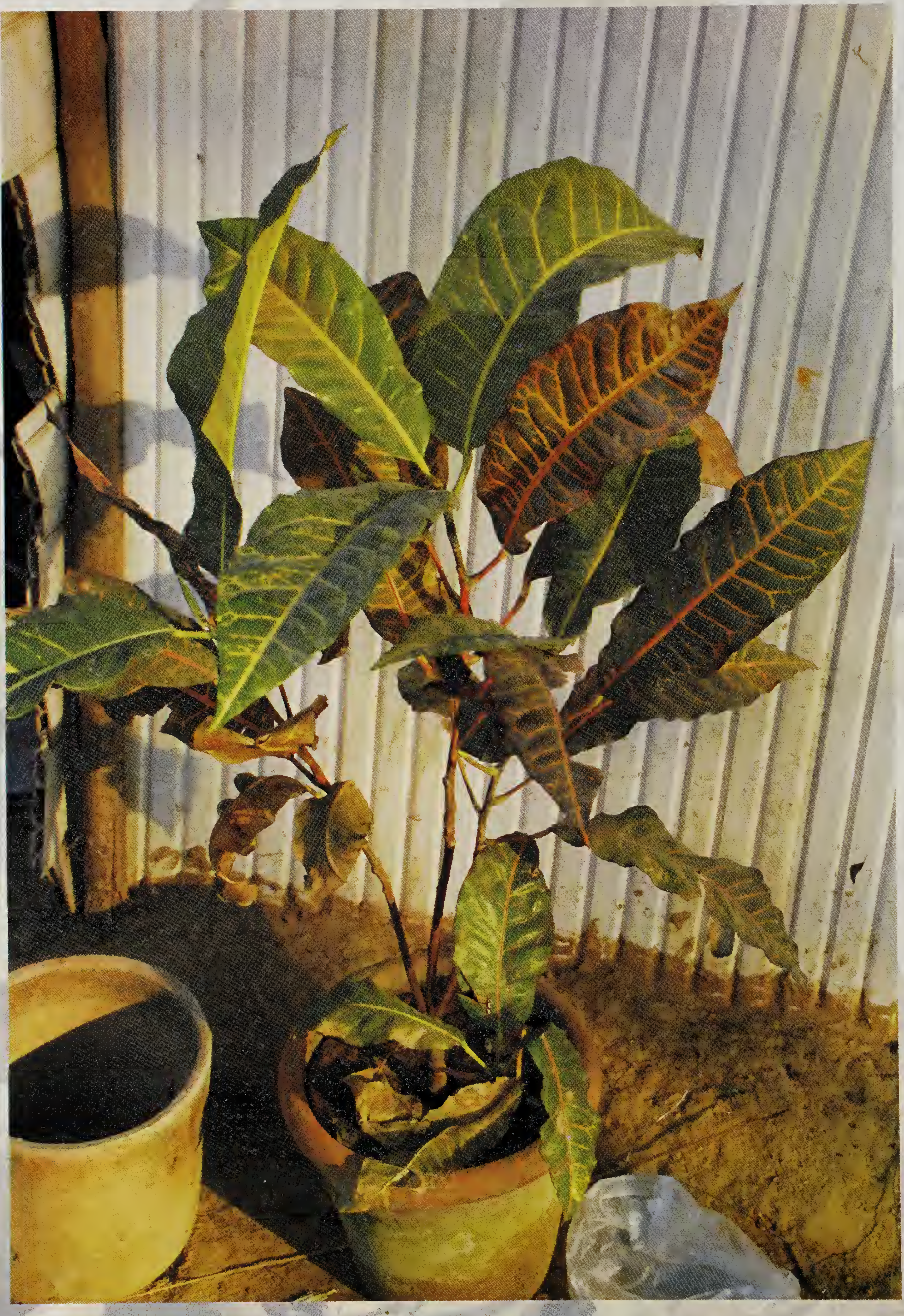


Bougainvillea



Croton

Among the flowering plants one should be keen to have are Roses, Bougainvilleas, Cannas, Chrysanthemums, Gladioli, Winter-Spring flowering annuals, Jasminums, Hibisci, Cacti, Succulents, Flowering Climbers, Lilies and a variety of other fascinating flowering or coloured foliaged plants and night bloomers.

Hedges can be planted along passages so as to protect the garden from dust and dirt as well as provide it with a beautiful enclosure. A well trained hedge is a good ornament for the garden simultaneously serving a useful purpose. Hedges could be used in a variety of ways, keeping them low, medium-sized or tall, suiting the layout of the garden.

A place allotted to shrubs in a garden is called the shrubbery. This is generally accommodated along the wall or fencing of the garden so as to provide a screen of greenery and flowers. Shrubs may be planted in straight lines, two to three in number, the tall varieties at the back, the medium-sized ones in the middle and the small ones in front. Group planting of trees and shrubs is also done to treat some situations aesthetically. Clipped shrubs prove immensely useful for producing a variety of effects-their shapes and forms being the deciding factors. For example, clipped shrubs on the slopes can provide an effect symbolising rock and stone compositions on hills. There are tall, medium and low shrubs and the selection of one or more types will depend on the situation and the overall composition.

Annuals, Perennials and Herbaceous Borders

Seasonal flowers occupy a point of vantage in herbaceous borders, which form an integral part in any scheme of English Garden. With the inception of British rule in India, the cultivation of seasonal flowers in winter and spring came to the forefront and even today, winter seasonal annuals are a must for any flower garden. These are planted on an extensive scale so as to make the garden colourful. They last for one season only, yet the colour effect they produce is matchless.

There is no dearth of these annuals and they can be grown with ease both in the hills and the plains. A variety of alluring patterns can be tried in formal beds, clumps in informal situations, in rock pockets, herbaceous borders and in the sunny, semi-shady and shady areas. For sunny, semi-shady and shady locations, quite an interesting variety of these annuals is available. There are annuals which will open only in the sun, annuals that will open during day time and close as the evening approaches, and annuals which will bloom at night time. Night blooming annuals can occupy a prominent position in schemes of Moonlit Night Garden.

As the perennials last for a number of years, it may be advisable to prefer the planting of more perennials to annuals since the latter last for one season only.

Planning for Fragrance

Needless to emphasise providing for an adequate number of redolent plants as perfumed blooms have for long captivated the imagination of Indians. Love of a plant because of the fragrance in its flowers or foliage that can be enjoyed in the remotest corner of the garden is typically an Indian character. The fragrant blossoms are also especially required for the deities. Consequently, a pleasure garden which is devoid of fragrant plants does not appeal to the Indian mind. The most prominent trees worth planting in an ornamental garden for their fragrant blooms are listed below:

Trees Yielding Fragrant Flowers

Alstonia scholaris, "Anjan", (greenish white); *Azadirachta indica*, "Neem"; *Calophyllum inophyllum* (white); *Canangium odoratum* (greenish yellow); *Citharexylon subserratum*. "Fiddle Wood Tree", (white); *Couroupita guianensis* (Petals yellow and tinged red on the outside and crimson-lilac inside); *Magnolia grandiflora* (white); *Mesua ferrea*, "Iron Wood Tree", (white strongly scented); *Michelia champaca*, "Sonchampa", (yellow) *Millingtonia hortensis* (pure white); *Ochrocarpos longifolius* (white) and *pterospermum acerifolium*, "Karnikar", (white) "Molsari," and "Mimersops elengi" (white).

In home gardens, where plots are proposed to be enclosed with tall screens of fragrant flowers, various types of climbers can be mixed and planted along ordinary angle iron and barbed wire fencing.

Popular climbers which yield fragrant blooms are: *Aganosoma caryophyllata*, (white); *Allamanda cathartica* (golden yellow); *Asparagus plumosus, A. sprengeri* (white) *Beaumontia grandiflora* (white); *Chonemorpha macrophylla* (white) *Clytostoma binatum* (rosy purple or mauve); *Hiptage madablota* (creamy white); *Lonicera japonica*. "Japanese Honey Suckle", (petals white tinged purple turning yellow); *Mandevilla suavelons*, "Chilean Jasmine", (white); *Odontadenia speciosa* (salmon-yellow); *Passiflora racemosa*, "Passion flower", (rosy crimson-scarlet); *Pergularia odoratissima* (greenish yellow); *Porana paniculata*, "Bridal Bouquet". (white); *Quisqualis indica*. "Rangoon Creeper", (white turning red, pink); *Rhynchospermum jasminoides* (white); *Roupellia grata* (pale-white tinged purple); *Stephanotis floribunda* (tube rose-like white flower); *Tecoma jasminoides* (white); *Trachelospermum jasminoides* "Star Jasmine", (white); *Vallaris heynei* (creamy white) and *Wisteria sinensis*, "Grape Flower Vine", *Wistaria floribunda* (white, mauve, purple, pink).

There are bulbous, rhizomatous or tuberous rooted plants which put forth beautiful blossoms enriched with fragrance. Prominent amongst them are:

Acidanthera bicolor (white with chocolate spots); *Alpinia sanderae* (corolla whitish possessing brown spots); *Amaryllis belladonna* (rose); *Convallaria majalis*, "Lily of the Valley". (white); *Crinum americanum* (white). *C. defixum* (white), *C. latifolium* (pale-rose), *C. longifolium* (white); *Crocus sativus.* "Saffron Crocus", (bright lilac); *Eucharis grandiflora,* "Amazon Lily", (white); *Hedychium coronarium* (snow white). *H. flavum* (yellow or orange, fragrant in the evening); *Hemerocallis flava* (lemon yellow); *Hosta plantaginea*, "Plantain Lily", (white); *Hyacinthus crientalis*, "Common Hyacinth", '(Purple, white and blue); *Hymenocallis calathina* (greenish white); *Iris germanica* (standard bluish and beard yellow), *I. Kashmiriana* (white); *I. Reticulata* (violet), *I. Unguicularis* (bright lilac); *Ixia odorata* (bright yellow); *Kaempferia rotunda* (white-tubed, violet-lipped); *Lilium testaceum.* "Nankeen Lily", *L. wallichianum* (creamy-white), *L. Candidum,* "Madonna Lily" "Bourbon Lily", "Lent Lily", "St. Joseph's 'Lily"; *Moraea iridioides* (perianth, with outer segments striped yellow and inner ones possessing brown dot); *Narcissus jonquilla*, "Jonquil'" (bright yellow), *N. poeticus,* "Pheasant's Eye", "Poet's Narcissus" (pure white), *N. Pseudo-Narcissus*, "Trumpet Daffodil", "Common Daffodil", "Lent Lily" (light green), *N. Tazetta.* "Polyanthus Narcissus'" (white, pure white or yellow), *N. Triandrus* (white); *Nymphaea odorata*, "Sweet scented Water Lily" (white), *N. lotus,* "Egyptian Lotus" "White Lotus" (pure white); *Ornithogalum arabicum* (white with black centre); *Polianthes tuberosa.* "Tube rose", (white); *Tulbaghia acutiloba* (greenish).

These will be superb in beds to themselves, as edgings to borders or in borders, in hanging baskets, for pot culture or for growing in bowls and receptacles.

The following are the prominent fragrant shrubs: *Acada-farnesiana* (yellow); *Artabotrys odoratissimus*, "Champa", (greenish turning yellow later); *Brunfelsia americana* (creamy white); *Buddleia madagascariensis* (pale orange to yellow); *Camellia Japonica* (red single or double); *Carissa carandus*, "Karonda", (white or pink); *Cestrum nocturnum*, "Queen of the Night", Night Blooming Jasmine" (greenish), *C. diurnum,* "Din Ka Raja" (white); *Citharexylon fruiticosum,* (white); *Clerodendron fragrans* (double white tinged pink); *Dombeya viscosa* (white with deep crimson base); *Gardenia lasminoides,* "Cape Jasmine". "Gandharaj" (white, creamy) var. fortuniana, (white, double), var. *lucida* (white turning yellow); *Hamiltonia suaveolens,* "Bain Champa". (white), *H. scabra* (Azure Blue); *Ixora parviflora* (white, single, semi-double or double white); *Jasminum sambac,* "Motia". "Bel Bela", "Bela" (white, semi-double or double), *J. sambac* var. flore-pleno. "Mogra" (white), *J. auriculatum*, "Joohi", (white), *J. arborescens*, "Newara" (white), *J. grandiflorum*, "Catalonian, Italian,. Royal or Spanish Jasmine" (white tinged pink); *Lawsonia inermis,* "Mehndi", "Henna", "Maruthani", "Mignonette", "Camphire (creamy white); *Magnolia soulangiana* (white on the inside and purplish outside), *M. coco* (white); *Michelia Figo*, "Portwine Magnolia". (brownish yellow with carmine edges); *Murraya exotica* (white); *Nerium odorum* (red, white, dark pink, rose etc.); *Nyctanthes. arbortristis*, "Har Singar", "Night Blooming Jasmine", "Tree of Sadness". (white vermillion stalked); *Oncoba spinosa* (white); *Parkinsonia aculeata,* "Jerusalem Thorn", (yellow); *Pandanus odoratissimus,* "Keora", (creamy white); *Syringa persica*, "Persian Lilac", (lilac). *Tabernaenontana coronaria flore-pleno* (white, double) and *Thevetia-nereifolia* (yellow).

These shrubs produce mild or strongly scented blooms. They can be put to excellent use in a variety of situations, viz., in shrubberies, herbaceous or mixed borders, clumps and rockeries.

Fragrant Annuals

The fragrant seasonal flowers are: *Alyssum maritimum*, "Sweet Alyssum", (white or purple); *Reseda odorata*, "Mignonette", (white or yellow); Violet-Sweet Violet (violet or rarely white); *Cheiranthus cheiri*, "Wall flower". (yellow or brownish yellow, in dwarf varieties white-yellow, brown, reddish and purple, dark, crimson); *Dianthus caryophyllus*, "Carnation", (yellow, pink, white, deep rose, pink, crimson, scarlet, red, the varieties Marguerite and Vanguard are scented); *Peansy*, "Hearts' Ease", (a variety of colours); *Petunia* (variety of colours); *Marigold* (yellow, orange and red, golden yellow) and *Sweet Peas* (many colours).

Fragrant Foliaged Plants

There are certain plants the foliage of which is fragrant. The planting of a few of them at suitable sites will make the garden more interesting. These plants are: *Aloysia citriodora*, "Lemon Scented Verbena"; *Alpinia sanderae*; *Artemisia arbrotanum*, "Southern Wood": *Cinnamomum camphora* (leaves greyish green); the citrus species *Clausena heptaphylla* (a herb); *Coleus aromaticus*; *Crossostephium artemisioides* (a dwarf shrub with whitish green leaves); *Eucalyptus*; the *Lantana species*; *Layandula spica*, "Lavender"; *Lemonia spectabilis*; *Myrtus communis*, "Myrtle", "Mehndee", Henna; *Ocimum sanctum* "Tulsee"; *Origanum marjorana*, "Marjorum Sweet"; *Pelargonium*, "Geranium", *P. abrotanifolium*, "Southern Wood'" (aromatic, Hazel scented), *P. bicolor* (fragrance like green almond) *P. capitulum*, "Rose Scented Stork's Bill" and *P. denticulatum* (Pine scented), *P. graveolens variegatum* (Mint scented); *Plectranthus aromaticus*, "Bread and Butter Plant"; *Rosa Rubiginosa*, "Sweet Briar" or "The Elegantine Rose" (shrub rose); *Brenda* (rose) (single-light pink flowers); *Lady penzanee* (rose); *Lord penzanee* (rose) and *Rosa Bradwardine.*

The fragrant Roses for planting in a pleasure garden are: *Rosa multiflora* (honey scented); *Grussan Zabern* (climber); *Old Katherine Zelmet* "Polyantha" (snow white); *Yonne Rabier*; *Crimson Glory* (strongly scented); *Wilhelm Kordes* (possessing yellow, red and biscuit-salmon colours); *Wendland* (very fragrant); *Pinocchio* (nicely scented, double); *Herrenhausen* (double); *Capistrano* (Hybrid Tea) (bright rose pink double); *Mirandy* (deep red tinged black. Hybrid Tea, double); *San fernando* (brilliant vermillion, double); *Old Gold* (single, Hybrid Tea), Pinkish buff; *Summer Snow*, "Floribunda" (white); *Pax* "Musk Roses", (rose-pink ever-blooming Shrub Rose, flower creamy in bud and white in fully open stage); *Penelope* (shell-pink, tinged saffron possesses characteristic musk fragrance) and *Vanity* (single flowers, soft-rose-pink, fragrant).

Other fragrant roses are: *Rugosa* and *Rugosa hybrids*. Amongst these "Agnes" (coppery yellow in bud stage and pale amber gold when fully open, double, highly fragrant) may be preferred. Among Damask Roses, *Damascena officinalis*, the original rose of Damascus, is fully double, bearing rose-pink blossoms and is rich in fragrance. Mme Hardy (white shaded pink) is another highly fragrant Damask Rose. Among Bourbone Roses, Adam Messerich (rose-red, bushy) and souvenir De La Malmaison (flesh coloured, dwarf and intensely fragrant) and among Noisette Roses, Marechal Niel (with double golden yellow flowers) may be chosen.

II

Soil Types

YOUR SUCCESS as a gardener depends on your knowing your soil well. Science now enables you to decipher the constituents of the soil in your garden and its strong points and its deficiencies. The-absence of even essential ingredients like mineral salts, for instance, can be made up by the application of manures and fertilisers.

Soil consists of a gritty rock powder and minerals. The disintegration of rocks takes place as a result of rain, frost, heat, cold, water action, sun's rays and atmospheric gases. Minerals constituting 90 to 99.8% of the soil are formed out of decay of compost, dead plants, dead insects, cattle dung and bird droppings in the crevices or cracks of rocks.

Soils vary in character. Their ingredients determine their-suitability for a particular type of plant. An ideal garden soil is one-in which sand, silt and clay are present in adequate proportions.

Soils may be neutral, acidic or alkaline in reaction. The degree of alkalinity or acidity of soil is expressed by the symbol p^H, whose neutral value is p^H 7. Soils with p^H value above 7 are alkaline and, below 7, acidic. The value of p^H is based on logarithms, the base being 10. For instance a soil showing a p^H value of 8.5 is 10 times more alkalinic than a soil having a p^H value of 7.5.

Most plants require a neutral soil. A soil with a p^H value slightly less than neutral is good for general gardening purposes. In no Circumstance should alkalinity be allowed to increase beyond 7.5.

A periodical soil test to ascertain the pH value is essential to evolve a proper soil treatment formula viz. application of correct types of organic and inorganic manures. Such a test will prove useful in the selection of plant material suitable for particular types of soils.

Soil texture governs the growth of plants. The term "texture'" means the degree of cohesion of the soil particles. Its connotation includes the size of particles.

Firminger, a leading authority, has given the sizes of soil particles in a table prepared for the U.S. Department of Agriculture.

Soil	*Size of each particle*
Fine gravel	1 to 2 millimetres

Coarse sand	1 to 5 millimetres
Medium sand	0.25 to 0.5 millimetres
Fine sand	0.25 to 0.1 millimetres
Very fine sand	0.05 to 0.05 millimetres
Silt	0.005 to 0.05 millimetres
Clay	0.006 millimetres and below

A plant grows well if the soil texture suits it. On it depends the penetration of roots into the soil. The roots take in nourishment from the soil in the form of solutions.

The capacity of the soil to release water is governed by the size of its particles. The finer the particles, the longer it takes for the soil to release water. Consequently, water logging develops. If water is not given up in a reasonable time, the water-soluble salts and chemicals in the soil do not get dissolved in it. Thus the nourishing solutions do not reach the root zone, resulting in poor growth of the plants.

Humus plays a vital part in plant growth. Rich in nitrogen, it has the capacity to loosen compact soils and bind together particles of too sandy or loose soils. Humus increases the water-holding capacity of the soil by 15 to 35 per cent. During drought, soils rich in humus keep their upper and lower surfaces moist for a longer time than soils deficient in humus. Humus absorbs the sun's rays quickly and accelerates plant growth. It helps in releasing some compounds in the soil which, in turn, act upon chemical elements present therein. Thus mineral nutrients are made available to plants which would otherwise have remained insoluble. Humus increases bacterial action in the soil considerably.

Soil types are as follows :

Heavy or Clayey Soils

In clayey soil, also called heavy soil, the number of particles present in one mm is 200 as against 20 in sandy soil. Hence the water-holding capacity of clayey soils is 10 times more than that of sandy soils. For instance, 100 lbs. of clay will hold 50 lbs. of water. Clay constitutes more than half of the soil in clayey soils.

Being badly drained, a clayey soil suffers from water logging. Such soils make horticultural practices very difficult, being slow in drying up in rains. In summer, cracks appear on clayey soils if conditions of dryness prevail. They are unable to warm up soon in rains and fail to provide ideal conditions for the growth of plants.

A heavy soil, if not cultivated regularly, becomes extremely hard. It is then not possible for air and moisture to reach the plants. When cultivated in a wet stage, heavy soil forms clods which are difficult to break unless they dry up.

A heavy soil can be improved by opening it up and then adding organic matter, viz., farmyard manure, straw, compost, burnt sweepings, rubbish, wood ash, sand and charcoal. Clayey soil is rich in potash but deficient in nitrogen.

Heavy or clayey soils which are deficient in humus become hard. When such a soil is dry, water absorption becomes difficult. Under such conditions plants can hardly grow satisfactorily. The addition of adequate quantities of humus will do away with these defects.

Sandy Soils

The number of particles in one millimetre of sandy soil is 20 or less. Sandy soil is usually well drained and is thus free from water logging.

One hundred pounds of sand will hold 25 lbs of water. Due to its low water-holding capacity, many soluble plant food materials are likely to be drained out quickly and lost, as in a period of drought. The addition of a liberal doze of organic matter will enable sandy soils to overcome this drawback. Usually, such soils lack phosphates and potash but are rich in silica. Suitable chemical fertilizers can make up for this deficiency.

Sandy soils absorb the sun's rays quickly with the result that plant growth is stimulated. Such soils are easy to handle. But they are likely to dry out sooner in summer, making the plants grown in them susceptible to drought.

Loam

Loam is a mixture of sand, clay and humus, with sand and clay being present in more or less equal proportions. Loam is porous and well-drained because of the presence of sand, thus eliminating chances of water logging; is retentive of moisture because of the presence of clay and is fertile and highly-productive due to the presence of humus.

Sandy and Clayey Loams

A loamy soil with a higher percentage of sand is called a sandy loam and one with a higher percentage of clay, a clayey loam.

Reh or Kallar

Alluvial clays and silts possess numerous under-composed mineral particles which, as a result of climatic factors, release sodium, magnesium and calcium salts. Due to capillary action, the top layers of the soil become infested with these salts, locally known as *Reh* or *Kallar*. Thus fertile land is made unfit for cultivation.

Such land can be reclaimed by the application of gypsum or lime and by regular irrigation. For the very badly damaged plots, application of gypsum or sulphur, accompanied by proper watering produces good results. Berseem, sugarcane and rice can also be grown on such a soil as these plants are salt-resistant.

Peaty Soils

Peaty soil is formed as a result of collection of a large quantity of organic matter in the soil. Such soils are formed as a result of decomposition of aquatic plants over a long period or due to the decomposition of organic materials under humid conditions. Peat is heavy, deep porous, rich in humus, black and highly acidic with a pH value varying from 3.5 to 4. For neutralization, it requires treatment with lime at the rate of 6-8 ounces per square yard.

Peat is defined by Louis Bush Brown and James Bush Brown as "the partially-carbonised residue of plants, the decomposition of which has taken place under standing water".

According to these authorities, peat is of four types, namely (a) peat of deep waters (b) peat of marshy areas (c) peat of swampy regions, and (d) peat of hog areas. Peaty soils are found on the sides of rivers and lakes. Such soils generally remain submerged under water during the rains.

Peaty soil contains 15-30 per cent of decayed organic matter which is easily workable and is rich in nitrogen and soluble salts. The peat present in the soil is capable of retaining moisture. It contains some iron sulphate because of being mildly acidic in reaction. It however lacks phosphates and potash which can be made available through chemical fertilizers.

Peat is generally utilised in the compost used for the cultivation, among others, of orchids, anthuriums and ferns. In dry form, peat is light and puff-like in appearance. After soaking, it should be spread over like a mulch and worked into the soil proposed to be treated with peat. Rhododendrons, laurels and azaleas, being lovers of slight acidity, relish peat. Oak and pine leaves on decomposition produce a leaf mould which contains peat besides organic matter.

Control of Acidity

Soils do not always maintain the same reaction *i.e.* pH value. This value is likely to shift towards acidity gradually owing to draining out of the more-readily-soluble elements such as calcium and sodium than of the acid elements like carbon and silicon. Soils also become acidic due to the prolonged application of fertilizers like ammonium sulphate, ammonium phosphate and urea which are acidic in reaction and leave the soil acidic after their application.

Acidity is overcome by treating the soil with lime. Hydrated lime brings about quicker results than ground lime. Lime should be worked in the surface soil. It should not be applied deep. Lime should never be applied along with animal manure or nitrogenous fertilizers as it leads to the quicker release of ammonia and the effect lasts only for a short while.

Lime also adds calcium to the soil, bringing about early decompensation of organic manure and releasing plant food which would have remained unutilized. Not more than 50 lbs. of hydrated lime or 75 lbs of ground limestone should be applied to 1000 square feet of land. Additional quantities, if needed, may be applied in instalments.

Control of Alkalinity

Control of Lime-induced Chlorosis

Iron is very essential to soils to create "chlorophyll" which develops the green-colouring matter in leaves. In the absence of iron, leaves present a mottled sickly-yellow and white appearance. Alkaline soils possess very little of iron and highly alkaline soils hardly possess any. The proportion of iron in acidic soils is higher than in alkaline soils.

In attempting to reduce acidity in soils by the use of lime, the danger however, persists of alkalinity being increased to an extent whereby the quantity of "soluble" iron in the soil is greatly reduced. This should be avoided. Plant growth in such a case is affected adversely. The-term applied to the prevalence of such a condition is "lime-induced chlorosis".

Control of lime-induced chlorosis lies in the treatment of the infested land with an uniform sprinkling of about 1.35 kgs. of finely powdered iron sulphate or ferrous sulphate to every nine square metres of the area. The surface soil should be lightly cultivated thereafter and watered copiously. The ferrous sulphate should not be sprinkled on the leaves as it produces a harmful effect.

III

Laying out a Lawn

A GOOD LAWN is a useful garden ornament. In the case of a home garden, it is its most decorative feature.

A lawn can be put to a variety of uses: For holding social gatherings; sitting out in the mornings and evenings; sleeping in summer at night; for relaxation during daytime in winter; and for playing games. The type of game would depend on the size of the lawn. Careful attention has, therefore, to be paid to the preparation of the lawn.

In landscape gardening, a proper gradation of the lawn is important. In keeping with the topography of the land, the lawn may be kept either level, concave or convex or graceful lines can be provided.

The lawn should be situated in a sunny area. Where water supply is limited, the lawn should be located on the northern aspect rather than on the southern.

To develop and maintain lawns in good condition is fairly expensive, laborious and difficult. To prepare a new grass covering on an open space in one season is easy enough. But a good lawn is the result of years of effort.

The tasks involved in laying out a lawn include: preparation of the soil; provision of drainage arrangements; ensuring a constant supply of water; weed eradication; adoption of horticultural practices comprising systematic manurial treatment; cutting of grass with a scythe and, later, mowing with a lawn-mower and regular watering.

Soil Preparation

Good vegetable soil, 22.5 cms-30 cms deep, is a must for developing a lawn. The soil should be well-drained and not remain soft for long after a shower of rain. A well-drained soil, firm at the surface, is the fittest one for a lawn.

Some soils are heavy and others are light. Heavy soil can be lightened by the addition of coarse sand. Light and sandy soil can be made more moisture-retentive by the addition of cow-dung manure and leaf mould.

In too sandy a soil, water drains out rapidly. In summer, dry conditions, therefore, prevail making the lawn look dry. In such cases, spread a 10-cm layer of clay, 37 cms-45 cms below the surface of the soil. The clay prevents excessive seepage. The remaining moisture is used by the roots of the grass by capillary action.

A soil rich in organic matter yields a good lawn. Well-rotted garden compost is rich enough in organic matter. Light soils require a large quantity of such compost to enable them to retain more moisture. On the other hand, heavy soils also benefit by way of improvement of texture and in the ability to drain out the surface water quickly by the addition of such compost.

In the USA, organic matter by way of peat moss and raw native moist peat are added as nutrients besides 30 tonnes of organic matter added to every 0.40 hectare. This organic matter is mixed in the top 12.5 cms-15 cms top spit of the soil by ploughing forking or spading. It is never laid in the form of a layer on or below the soil surface.

Commercial fertilizer is also added and mixed in the top 12.5 cms-15 cms top spit of the soil. This fertilizer comprises five per cent nitrogen, 10 per cent phosphorous and five per cent potash. The rate of application is: 15 lbs per thousand square feet of soil of average fertility and 25 lbs-30 lbs per thousand square feet of soil of low fertility.

A soil neutral in reaction is best for laying out a lawn although soils ranging in pH value from 6 to 7 are equally good.

Acidic soils are not good for lawns. They need treatment with hydrated lime.

The rate for application of hydrated lime is as follows:

Soil pH Value	*Sq. ft.*	*Qty.*
4-5	1000	60 lbs.
5-6		50 lbs.
Less than four		50-60 lbs. (at a time)

Where the pH value is less than 4, two applications of hydrated lime should be made, each at the rate of 50 lbs-60 lbs per 1000 square feet.

Hydrated lime is one and a half times stronger than limestone. If limestone only is used the dosage should be one and a half times the dosage of hydrated lime. The limestone must be ground finely.

Lime improves the physical texture of the soil, increases its water absorption capacity and fortifies it with magnesium and calcium. The effect of lime lasts for several years. However, it is fully effective four to five months after being applied and this effect lasts for several years.

Excessive application of lime is also harmful. It should be applied again only after three or four years.

Another aspect of soil preparation is “trenching”.

Trenching

Trenching is done by digging the soil so as to loosen and soften it. The object is also to prepare the sub-soil so that the grass roots draw nourishment with greater ease. In trenching the sub-soil is not brought to the top. Trenching is done in the hot weather. May and June are the best months for this operation. Simultaneously with digging, soil should be cleared of stones and other matter.

In trenching, a 60 cms-75 cms wide trench is dug up 30 cms-45 cms deep. In this method, the top spit of one trench takes the place of the top spit of another trench but in an overturned and well-broken condition.

In some cases, a thin layer or a layer of medium thickness of some impermeable substance appears about 37 cms to 45 cms below the surface. This affects water drainage. In this case, trenching to a depth of 60 cms solves the problem. The soil in the filled up trenches should remain exposed to the sun for about a month after digging. Weeds will thus be killed and the soil will also be fully pulverised.

Drainage

Drainage aims at the removal of water which is beyond the capacity of the soil to retain.

The evil effects of water-logging, are many. Soil in water-logged land turns sour, making it unfit for cultivation. Further, the proper airing of the soil is prevented.

As a result of water logging, salts are deposited on the soil surface by water accumulated below the soil. When as a result of evaporation, water ascends to the surface, salts are deposited on the top layer of the soil.

Removal of the salts and surplus water enables the roots of plants to breathe properly. Bacterial action in the soil is also promoted. This bacterial action converts the organic nitrogen into soluble nitrates which are vital to the proper growth of plants.

Whether a particular bit of land needs drainage or not can be ascertained as under :

1. If after a heavy shower of rain, the water stagnates for more than a few hours then the land needs drainage.
2. If during winter or spring a few pits, a metre deep, are dug and water percolates very rapidly into the pits, the land needs drainage control.

Artificial drainage can be provided by making one side of the lawn 7.5 cms to 10 cms higher than the other. While facilitating drainage, this slope of the lawn will be only gradual. The lawn will not look awkward.

The problem of removing surplus water can be solved in some cases where the land is badly drained by adding a 10-cm thick layer of ash, sand ground-stone or gravel in the sub-soil region *i.e.* 12.5 cms to 15 cms below the top spit.

Proper drainage helps in raising a good lawn even on water-logged lands. It is necessary here to ascertain whether water accumulates at or below the surface. Water accumulation, below the surface, can be drained off only through pipes.

Water can be removed from land either through open drains or covered pipes. Unlike the open drain, the covered pipe drains do not detract from the presentability of the lawn.

The main drain pipe may be of two measurements: 10 cms (4") diameter or 7.5 cms (3") diameter. The side pipes should be, respectively, 7.5 cms (3") diameter and 5 cms (2") diameter.

The main drain pipe should be laid straight, with an even gradient from the head towards the point of outfall *i.e.* the highest to the lowest point. That should be a slope (or fall) of not more than one in hundred. The side pipes should be located 3.5 metres to 6.5 metres or 10 to 20 feet apart and be parallel to the main drain. The branches (laterals) should join the main pipe at an angle of not more than 60°. The fall of the lateral should be more towards the main drain pipe. The main drain pipe should have socket pipes where the laterals and the main meet.

In landscaping, where slopes are given on either side, a depression is created at the middle. Here the main drain pipe should be laid in the area of depression. Trenches are needed for laying the main and side pipes and laterals. They should be about 37.5 cms (15”) deep and be filled with crushed stone.

Varying with the texture of the soil, the depth at which drain pipes should be laid is one-three metres. In some soils, the depth is 45 cms 08"). Where the drain pipes are laid close to the surface, the land dries up quickly. Brown patches appear in the regions where the pipes are laid. This should be avoided. Pipes should be laid deeper. Pipe drains should be laid straight on an even grade. In a length of 30 cms (1 foot) of pipe, the maximum permissible fall will vary from 3.125 mms 0/8 inch) to 6.25 mms (1/4 inch).

Drain pipes can be laid in heavy soils at a shallow depth, not deeper than 75 cms (2½ feet). In sandy soils, the depth can vary from 1 metre (3 feet) to a little more (3½ feet). The distance between the drains should not exceed 6½ metres.

In light soils, the pipes should be placed at the bottom of the trench where it is made firm and surrounded by ballast up to a height of 15 cms from the upper surface of the pipe. Thereafter the area is filled with dug up soil.

In heavy and very heavy soils, the area around the pipe and up to a height of 37.5 cms (15 inches) up to the line separating this loose top soil from the clay sub-soil should be piled with ballast. Above that should be placed the dug up soil. The outlet for water from the soil in this case should be at a level lower than the main drain pipe.

Types of Pipes

For underground drainage, common earthen ware, glazed pipes or pipes with thick walls of porous concrete can be used. Glazed pipes are hardier and long lasting.

Underground pipes should be fitted closely especially in the tree region to prevent tree roots entering the joints. Cementing of portions can be done. If it is not possible to go in for this type of pipe drainage method the area should be dug upto a depth of 60 cms, the lower most 15 cms of it can be filled with ballast and the rest (30 cms) with dug up soil, layers of grassy turves and sand interspersed.

The area in which the drain pipes are laid should be given a slope. It should also be connected with a sump filled with drainage material such as brickbats. This will drain out the extra water from the soil into the sump from where it will dissipate in course of time.

Another preliminary before planting grass, which is generally done in the rainy season, is to prepare the area. A few days before the rains, the clods of earth are broken and the prescribed manure is mixed in. Then the area is flooded with water so as to allow the soil to settle down. Uneven spots and depressions are filled in after the soil dries up. Then follows rough dressing and fine dressing. Thereafter, the land should be levelled perfectly, if possible with the help of a theodolite. Give a slope of 6 mms from one end to another.

Laying Grass

Grass can be laid by sowing either seeds or planting cuttings or joints of a selected grass variety. The usual popular practice, particularly in India, is to plant grass cuttings with roots.

The best time for planting is when the weather is dull after a shower of rains and there is no direct sun. Grass roots establish more quickly in such an atmosphere. July is the ideal month for planting grass as the first shower enables the grass roots to get well established. One of the best varieties, and a popular one too, is “Doob” grass, botanically called *cynodon dactylon*. It is known as “Hariali” in the South. It gives a good surface. It grows under varied conditions. It can grow on moist river banks, soils containing “brick and lime rubbish”, soils of the warm and moist climate of Malabar and the hard soils and rigorous atmospheric conditions of Baluchistan.

Planting

For planting grass cuttings, the land has to be levelled. Holes, 15 cms apart, should then be drilled in it. Cut pieces of stems, 5 cms—7.5 cms long, of mature "Doob" grass with roots, should then be planted at distances 7.5 cms from one another.

Sowing Seeds

Lawns can also be developed by sowing seeds. About 500 gms of seed are to be sown for every 200 square metres of a new lawn. The seed is generally used at the rate of about 56 gm-84 gms (2-3 ozs) per square metre. To lay a lawn of one acre with "Doob" grass, about 11.25 kgs (25 lbs) of seed are needed.

Ten days before sowing the seeds a dressing of fertilizers in the following proportions per square yard (0.83 square metre) is recommended: 28 gms (one oz) of ammonium sulphate, 28 gms (one oz) of superphosphate, 7.3 gms (quarter oz) of potassium/sulphate and 56.25 gross (2 ozs) of bone meal.

To prevent seeds being eaten by birds, prior soaking in paraffin is essential. Good results are obtained by spreading seeds uniformly in a mixture of diluted fresh cowdung. Thick sowing is advisable to minimize growth of weeds and to prevent damage from heat in summer and frost in winter. In no circumstance should weeds be allowed to be present on the land while the seeds germinate and seedlings grow.

A top-dressing of leaf mould and wood ash on a newly-planted grass area proves useful. To promote grass growth, compost or superphosphate of lime or bone meal should be raked into the surface of the lawn. The compost can be of any natural manure such as well-rotted cowdung mixed with good soil and applied at the rate of 20-25 tonnes to 0.4 hectare of land. Superphosphate of lime or bone meal should be applied at the rate of one tonne per 0.4 hectare of land.

If trenching is done in May-June and grassing is done by the end of July, the grass roots will put forth green shoots within a week or 10 days. The lawn will be developed well by November-December.

Watering

After planting, the ground should be watered properly till the grass roots establish themselves. Watering has to be copious when the new growth starts.

During dry weather, the lawn should be sprayed well with water so as to give it a thorough soaking. Flooding should be done once a week. In summer, mere sprinkling of water on the surface does more harm than good. If there is water shortage, sprinkling should be done in the evenings.

Bamboo Gate

Sitting Space

Home Garden

A Well Kept Garden

A Grass Lawn

Purple Cineraria

Majenta Cineraria

Cosmos

Clarkia

Salvia

Helichrysum

Papaver

Tagetes

Hollyhock

Saturation of the root zone of the grass, to a depth varying between 30 cms to 60 cms, is achieved by letting in about 1,13,750 litres (25,000 gallons) to every 0.4 hectare. In lawns in the plains of North India, the yardstick of watering is: five waterings a month for four months in summer; three waterings a month for five months in winter and no watering at all for three months of the rainy season, except during dry spells.

Weeding and raking should be done periodically. This process should be repeated till the grass is well established. Regular mowing, weed removal and application of manure and fertilizers are the key to success in the maintenance of a lawn.

If these precautions as well as other horticultural practices are adopted regularly, a lawn can keep up its elegance for a period of six to nine years.

Maintenance of a Lawn

General

When the newly-sown grass establishes itself and is 2.5 cms high, a light roller may be used. Its use can be continued for the first three months. The soil should not be unduly damp at this time. A heavy roller may be used in the months of November and December.

The first cutting of the grass with the scythe (jhaban or khurpa) may be done when it goes up to 7.5 cms to 10 cms. Cutting enables the grass to develop a number of lateral and horizontal shoots, thus forming a nice carpet.

Mowing with a lawn-mower should begin in March and continue till November.

It is better to cut the grass with the scythe in the morning when the grass is wet. Thereafter, the lawn-mower should be used. The mower is used when the lawn is dry. The blades must be 2.5 cms above the normal level for the first three or four cuttings. A close cutting machine is needed for lawns used for playing purposes.

The machine should always be used with the grass tub as the cut grass, if allowed to fall on the ground, will obstruct aeration of the soil, weaken the grass and make the soil spongy.

The lawn should be swept with a hard broom prior to the use of a mower.

Manuring

Nitrogen, phosphorous and potash are essential for the proper upkeep of a lawn.

Nitrogen enables leaves to grow fully; phosphorous is good for roots and potash makes grass resistant to disease and insect pests.

Manures can be added in natural form or as chemical fertilizers. Chemical fertilizers should always be applied in liquid form or be evenly spread as a superficial dressing, after soaking the land with water. After application also the land should be thoroughly watered.

Nitrogen is available in ammonia components, nitrate compounds and inorganic compounds. However, an overdose of nitrogen can be harmful.

Potash is usually supplied in the form of muriate of potash and phosphorous in the form of super-phosphates. Ammonium sulphate helps in eradicating weeds and in making the grass green. Used in excess, however, it has a tendency to make soil acidic.

It has been noticed that nitrogen applied to highly acidic soils is absorbed but not assimilated by the grass. The result is toxic reaction. Grass takes new roots every year in spring. Old roots decay and add humus to the soil. This process is absent in acidic soils which become sod-bound.

Deficiency of iron in the soil affects the production of chlorophyll, the green colouring matter, in plants. Iron is insoluble in an alkaline soil. In such cases, it is applied in the form of powdered iron sulphate (ferrous sulphate). About two or three pounds are applied per thousand square feet. The powder should be spread evenly over the lawn and pressed into the soil. The area should be watered.

Sutton's Grass Fertilizer may be applied before the sowing of grass seeds or as a top dressing. The application should be monthly or quarterly depending upon the condition of the land. The rate of application is: 100 gms-120 gms to a square metre of land a week before the sowing of grass seeds and 60 gms-75 gms per square metre as a top dressing.

Organic Manure

Horse manure is suitable for top dressing of lawns. Its application is highly beneficial to lawns in constant use throughout the spring, summer and winter. In October, after the rains, the whole lawn should be cleaned of the grass with the help of a scythe (*jhaban* or *khurpa*). Thereafter, with the appearance of new growth, a 6.25 mms layer of finely-sieved manure should be spread over the lawn. Copious watering should be done. Grass thus treated will stand the cold well and form a lush green crop throughout the year.

From November to March, chemical fertilizers should be applied. Ammonium sulphate, a rich source of nitrogen and phosphorous, should be given at the rate of three or four lbs. per thousand square feet.

In areas whose climate is comparable to English conditions, we may follow some of the recommendations of the Royal Horticultural Society, London.

In spring, the following ratios may be observed for top dressing : Two ounces per square yard with artificial fertilizers comprising 15 parts of ammonium sulphate, 15 parts of dried blood, 40 parts of bone meal, 25 parts of superphosphate and 5 parts of potassium sulphate. In autumn, another top-dressing of a mixture of finely-sileved soil and well-decomposed leaf or farmyard manure is recommended.

Solutions to Some Problems

Bare or Marshy Patches

Bare patches should be re-grassed every year. The area should be trenched, dressed and seeded or planted with "Doob" grass during the rains. The Surrounding grassy area should be cut more often than the bare area to ensure uniformity of appearance.

Grassy areas around water /hydrants often become marshy. Such areas could be treated with pebbles. Circles, ovals and other irregular shapes can be given to these pebbled areas.

Worms and Worm-Casts

Earthworms inhabit lawns and other areas. During rains, the worms throw out on the surface of the lawn earthworm-casts. As a result the appearance of the lawn is affected.

In some cases, particularly in heavy soils, the presence of earth-worms and earthworm-casts is helpful. Earthworms burrow to a great extent into the soil. As a result water and air penetrate more. The soil is thus improved.

In case the lawn is not to be used during rains, worm-casts can be allowed to remain on the grass. After a shower the casts will dissolve. This helps to renew the surface soil with a fine earth.

In well-drained soils, worms and worm-casts, however, cause more harm than good. The grass becomes weak and weeds tend to grow.

To eradicate worms the lawn should be watered with a weak solution of carbonate of ammonia. Another specific remedy is a solution of mercury perchloride in water. To treat 100 square yards, three ounces of mercury perchloride dissolved in 50 gallons of water will be sufficient.

Protection against Rats

To prevent damage to lawn by rats, small tablets of a zinc sulphate preparation can be placed in each burrow. Close the burrow with mud and leave it undisturbed for four days. The rats die within the burrow. The tablet is made of one part of zinc sulphate, 19 parts of wheat flour and an adequate quantity of water.

Weed Eradication

A number of varieties of weeds grow in lawns. Unless these are eradicated completely, a lawn will not develop properly.

The common types of weeds are :

Cyperus Rotundus

Commonly known as "Nut grass" or "Coco grass", it is also known as "Motha" in Northern India; "Lavala" and "Nagar motha" in the Deccan and "Mootho" in Bengal. Waterlogged soils are highly susceptible to this weed. It grows quickly in tropical and sub-tropical areas. The weed grows to a height of 10 cms to 60 cms with many leaves.

Apart from uprooting the weed, a method of treating the soil to prevent the growth of this weed is possible, though expensive. The top 15 cms of the soil should be removed before seed sowing. The soil, along with garden refuse, should be heated for a day in temperatures going up to 60°C. This method is, however, expensive and cumbersome.

Doodia

Belonging to the genus *euphorbia,* popularly known as *doodia*, it is a very aggressive weed which grows prolifically in neglected lawns. Its growth and further spread can be kept under check only by constant weeding.

Indigofera

Indigofera is reddish in appearance. This weed is commonly found in lawns in the month of March. This weed can be eradicated by the application on the area infested of a dressing of three parts of sulphate of ammonia, one part of calcined sulphate of iron and 20 parts of sand by weight.

Sacc Harum Spontaneum

It is also known as "Kash" in Bengali. It is a very sturdy type of grass which develops as a weed on lawns laid with *Cynodon dactylor* in tropical and sub-tropical areas. The weed bears silvery-silky flowers on 20 cms-30 cms long terminal-panicles.

The weed grows profusely if not kept under check by regular cutting.

For lawns not severely infested with weeds, a monthly dressing is prescribed. This should consist of three parts of sulphate of ammonia, one part of calcined sulphate of iron and 20 parts of lime-free dry sand, all proportions being calculated by weight. Application of this mixture should be at the rate of 110 grams per 0.83 square metre.

Another specific applied is "lawn" sand. "Lawn" sand may be applied on lawns intensely infested with weeds like Dandelions and Daisies. "Lawn" sand is made by mixing 35 parts of sulphate of ammonia, 15 parts of calcined sulphate of iron and 50 parts of dry sand by weight.

IV

Seasonal Flowers

A CHANGE IN SEASON brings about a marked change in the garden. New plants suited to the incoming season bring out shoots. The garden begins to wear a fresh appearance with the bloom of seasonal flowers. This is so in summer, the rainy season, winter and, particularly, in spring.

Winter and Spring Flowers

The garden in winter and spring owes much of its charm to seasonal flowers. There is a large diversity of seasonal flowers of winter and spring. The most popular among these are described in this chapter. Some flowers love a shady situation; others a semi-shady situation and some open only in full sunshine. Yet others relish an open and sunny location. Some annuals are very effective as edgings to borders. A few of them are ideal for hanging baskets and rockeries.

Seeds of winter annuals are sown between August and November. Sowing can be done in pots, boxes or seed pans and in seedbeds. Large seeds such as of Sweet Peas, *Helianthus* (sun flower) and Nasturtium are sown 1.25 cms to 2.5 cms deep and 7.5 cms apart. Small seeds such as of *Phlox, Petunia* and *Torenia* are sown 3 cms deep and 5 cms apart. Seeds of *Sweet Peas, Alyssum, Nasturtium, Calendula, Eschscholtzia* (Californian Poppy) and *Stock* may be sown direct, as seedlings do not stand transplanting well. In other cases, seedlings are transplanted at permanent sites when they have attained a height of 5 cms to 7.5 cms. Twiggy branches are tucked in to afford protection and shade till the seedlings begin to have a quick growth.

Seedlings may generally be spaced 15 cms, 30 cms and 60 cms apart for the dwarf, medium and tall varieties, respectively. A mixture of bone-meal, superphosphate and potash well mixed in water should be applied twice, once when the plants are in bud and later, during the flowering period. Six ounces should be applied per square yard.

Winter Annuals

Three plants, the *Phlox, Verbena and Dianthus*, which flourish in open and sunny locations, have the longest blooming period and possess a variety of colours in their flowers.

Phlox drummondii—Polemoniaceae

White, red, vermillion, pink, deep blue, buff and variegated shades are the colours of *Phlox drummondii.* A hardy annual, it is propagated by seed from September to October. Ordinary garden soil is suitable. Late sowings yield flowers up to summer. Early-sown *Phlox* start bearing flowers by the end of September. They are in full bloom in November. The seed should be sown thinly in nursery beds and the seedlings transplanted. Dwarf varieties attain a height of about 15 cms and require spacing of 15 cms; the larger varieties-25 cms or 30 cms high-are kept 30 cms apart. Extreme cold does not affect flowers adversely. The flowers are usually borne in terminal corymbs. The petals are salver shaped. The fruit is a capsule with one, two or many seeds in the three cells. *Phlox* is good for beds, pots, edgings and borders.

Verbena officinalis—Fam: Verbenaceae

Verbena is a quick-growing annual, bushy and of a free, flowering nature. Flowers are small or of a moderate size, borne solitary in the axils of small bracelets. Petals are salver-shaped. The flowers are varied, scarlet, rose, white, pink, red, purple, mauve, violet, 'deep-blue and lavender.

A well-drained and rich soil in necessary. *Verbena* is propagated by need in September and October. If sown late, the flowering continues till the hot weather. Seedlings should be transplanted 30 cms apart when 5 cms or 7.5 cms high.

Dwarf varieties attain a height of about 15 cms and require spacing of 15 cms to 22.5 cms. A nice colour effect is produced if *Verbenas* of different colours are planted in raised beds at different heights or in terraces.

Dianthus Chinensis—Fam: Caryophyllaceae

Dianthus Chinensis is popularly known as the *Chinese* or *Indian Pink*, while *Dianthus Heddewigil* is known as the *Japanese Pink.* A rich and well-drained soil is necessary. *Dianthus* looks best in raised beds. Propagation is by seed which is sown in October; seedlings should be transplanted 25 cms to 30 cms apart as soon as they grow 5 cms to 7.5 cms.

Flowers are brilliantly coloured, attractive and of lasting quality. There are single and double varieties. Salmon-pink, vivid scarlet, pure white and rich crimson are the popular colours of single and double varieties. Disbudding and the removal of side growths in the early stages, help produce better quality flowers. Removal of the withered flowers before the formation of seeds in pods prolong the blooming period. Some species such as *Dianthus Alpinus* are ideal for rockeries.

Hollyhock—Althaea Rosea—Fam: Malvaceae

An old time favourite, it is not so frequently planted because of its susceptibility to rust. The plant, in both single and double form, is favourite for ornamental gardens because of its tall stature and beautiful flowers which are in clear colours and blended in fascinating shades.

Hollyhock requires a deep rich soil. Plants are grown from seedlings which are best raised every year. Seeds are sown in September. The flowers bloom from December to February. Successive sowings ensure flowers up to summer. Avoid drought conditions as this invites rust. Retain only two or three shoots per plant to ensure vigorous growth. Hollyhock is very effective in the background of a herbaceous or a mixed border or for screening purposes.

Cosmos synonym Cosmea (Compositae)

Cosmos Bipinnatus is an annual in its prime of beauty from winter to spring. Propagation is by seed. A sandy soil and a sunny location are needed. Too rich a soil induces a luxuriant vegetative growth but scant flowering. The flowers, white, pink or crimson, are the popular varieties met with in this species. There are single and double flowering varieties. The single flower appears in many shapes, flat, cup-shaped, incurved and reflexed. The flowers possess a conspicuous yellow disc. The single as well as the double forms are very effective for mass display in extensive flower beds or borders.

Helianthus—(Compositae)

Helianthus is popularly known as the sun-flower. The flower heads are large, solitary or in corymbs. The giant-sized variety attains a height of 1.7 metres or even more. The single variety is medium-sized.

Sun-flowers are hardy and can be easily grown from seed in almost all soils. They do not thrive well in a shady place. The perennial species are heavy feeders. Seeds should be sown at site or singly in pots. From the pots the plants can be transplanted when necessary. Six pounds of seeds are sufficient for 0.4 hectare of land allowing for 90 cms between rows and 22.5 cms between individual plants.

It is very interesting to watch the sun-flower responding faithfully to the seeming movements of the sun. The flower facing the east in the morning turns to the west at sunset and points to the east again at the time of sunrise the next morning.

Delphinium Ajacis "Larkspur"—Fam: Ranunculaceae

The *Larkspur* bears spikes of attractive flowers in shades of white, shell-pink, rose, lavender, purple and blue. It is one of the most decorative and hardy annuals, flowering for a long time. *Larkspurs* do best in a well-drained soil. Never add fresh manure to the soil. As *Larkspurs* do not stand transplanting well, seeds should be sown at site or in pots from where seedlings can be transplanted. Some *Larkspur* varieties produce large double flowers and other dwarf varieties grow up to 30 cms only.

Cornflower

Centaurea cyanus is popularly known as "Blue Bottle" and "Cornflower". It thrives even in a poor soil. The blooming period being short, successive sowings are necessary to enure a continuous supply of flowers. Cornflowers are sown in October at site. They do not stand transplanting well. Watering over the plant is harmful but at the roots is useful.

Annual Chrysanthemum

Chrysanthemum—Carinatum—Compositae

The plant produces single and double flowers in attractive shades of white and yellow and variegated. It is a free-flowering annual producing flowers for a long time in succession. Propagation is by seed which can be sown from September to October. The plant is good for pot culture too. *Chrysanthemum Coronarium* grows to a height of a little over a metre, with two pinnali foliage and flower heads of a pale yellow colour.

Mathiola Incana "Stock"—Cruciferae

The common stock also known as the *Gilliflower* (botanically *Mathiola Incana*) to which the garden forms of "stock" origin, a biennial or a perennial, is known as an annual in ornamental gardens and parks. It bears purple flowers in terminal erect racemes. The variety *Annua* is an annual which bears single or double flowers in many colours.

The garden *stock* includes tall and dwarf varieties. Propagation is by seed. Seeds are sown in September and October in seed bed or earthen pots, in a sandy soil, to which no manure has been added. Seeds germinate in seven to ten days. The seedlings can be transplanted to permanent sites. Cool weather and the presence of lime in the soil enable this annual to produce good flowers.

Stocks form excellent pot plants. They can also be planted in herbaceous borders.

Clarkia—Fam: Oenotheraceae

Clarkias bear very showy flowers and are useful for planting in beds, herbaceous borders, clumps or in pots. *Clarkia elegans* bears flowers in long, loose sprays and *Clarkia pulchella* bears flowers in clusters. Salmon-scarlet is the brightest-coloured of all *Clarkias* and the flowers are fully double. The stems of Clarkia plants are coppery in appearance. There are also various colours such as white, purple, rose, salmon-pink and crimson. The fruit is a capsule.

Helichrysum Bracteatum—Compositae

Popularly known as the *Everlasting Flower* or *Straw Flower*, it bears papery flowers. A rich loamy soil is best. Flowers are yellow or orange and 2.5 cms to 6.25 cms across and are surrounded by an involucre of bracts of a conspicuous yellow pink. These bracts are dry and hard. Flower heads are solitary or clustered. There are varieties bearing flower heads in colours of white, pink, salmon, dark-scarlet, violet, golden yellow and dark blood-red. In the variety *bicolour*, the flower heads are yellow and the tips of the scales red.

Cheiranthus Cheiri Wallflower—Cruciferae

Although a perennial, *Wallflower* shows deterioration after a year or two. Hence renewal from seed is required every year. For securing the best results, it is cultivated as an annual. The blooms show variation in size and colour.

There are dwarf as well as double forms available in shades of white, yellow, brown, reddish-purple and dark crimson. The variety *Harpur Crewe*, growing to a height of about 22.5 cms, produces double flowers of a glowing golden-yellow.

Propagation of varieties bearing single flowers is by seed which comes true to type. The double blooming varieties are reproduced by cuttings. A well-drained ordinary garden soil and an open sunny location is good for *Wallflowers. Wallflower* looks effective in borders, rockeries and pots. These flowers are also useful for cut purposes.

Mimulus Luteus—Fam: Scorphulariaceae

Popularly known as *Monkey Flower* or *Monkey Musk*, *Mimulus Luteus* is grown as an annual in gardens. Seeds are sown in October in pots. Soil consisting of two parts of loam, one part of well-rotted cow dung, and one part of leaf mould, with plenty of sand, is ideal. The flowers are bilipped. The upper lip is two lobed and the lower one possesses three lobes. Each petal is yellow and dotted with dark spots on the inside. Propagation is by cuttings which should be planted is moist sandy soil.

Gypsophila elegans: Caryophyllaceae

The plant is a popular winter annual raised from seeds. Its small flowers are borne in panicles on stiff stems in shades of white, rose, pink and crimson. *Gypsophilas* are of branching and spreading types. *Gypsophila elegans* relishes a sunny location and a dryish soil with lime in it. It grows to a height varying from 30 cms to 50 cms.

Gypsophila is popular with florists for it serves well as a cut flower. For mixed borders *Gypsophila* is very effective, especially when planted in front of Sweet Peas. *Gypsophila Oldhamiana* is good for planting in beds or borders or in pots.

Pimpinella Monoica (Umbelliferae)

The plant is popularly known as *Lady's Lace*. The loose sprays of lacy white flowers, borne in compound umbles, are very impressive. The cut flowers are excellent for vases and bouquets. The leaves, which are pinnate, look highly ornamental. They are also aromatic. *Lady's Lace* will grow well in an ordinary garden soil. Propagation is by seed which takes about three months to bloom.

Saponaria Calabrica—Fam: Caryophyllaceae

Popularly known as *Soapwort*, this plant displays star-like blooms in shades of pink, white or red. This annual species of *Saponarias* relishes a well-drained soil and is propagated by seed. *Saponaria Calabrica* attains a height of 15 cms. to 30 cms. bearing flowers in dichotomously-branched corymbose panicle. *Alba* is a variety bearing white blooms and *Scarlet Queen* produces red flowers.

Garden Nasturtiums—Tropaeolaceae

Popularly known as the *Nasturtium of Gardens* there are three species namely *Tropaeolum minus* (*Dwarf Nasturtium*), *Tropaeolum majus* (*Climbing Nasturtium*) and *Tropaeolum peregrinum* (the *Canary Creeper*). They are grown as annuals in the garden in the plains. The perennial species is ideal for the hills. Ordinary garden soil is good for *Nasturtiums*. Richly-manured soil is to be avoided as it leads to more foliage and scarce flowering.

Tropaeolum Minus is a dwarf glabrous non-climbing annual. The leaves are roundish and the flowers, produced in great profusion are deep yellow. Propagation is by seed sown at site. Semi-double to fully-double varieties are available in shades such as cerise-scarlet, primrose and mahogany. This plant is good for borders, edgings and pots.

Tropaeolum Majus, (*Indian Cress*), is a climbing *Nasturtium* which produces large flowers of a bright yellow or orange colour. This variety grows in numerous forms, different in size and colour.

Tropaeolum peregrinum, Canary Creeper or *Canary-Bird Flower*, is a very quick-growing and climbing type. The flowers are spurred with the upper portion, comprising two petals, being large and the lower portion of three petals being small and narrow. *Tropaeolum Majus* and *Tropaeolum peregrinum* are excellent for hanging baskets, as ground covers and for covering slopes in winter and spring.

Antirrhinums

Antirrhinums are also known as *Snapdragons*, because the flower, when pinched and released, snaps like a drogon. *Snapdragons* are of three sizes: tall, medium and dwarf. The species grown in gardens as an annual, for bedding and ornamental purposes in borders or clumps, is *Antirrhinum Majus*. It can be grown as a perennial too.

The dwarf varieties, varying from 10 cms to 15 cms, prove ideal as edgings to borders. These varieties offer a wide colour range: white, pink, yellow, scarlet, crimson, orange, lilac and mauve. Double forms are also available by crossing *Antirrhinums Majus* with *Antirrhinums Molle.* Hybrids have been evolved which possess creeper characteristics and are capable of creating gorgeous carpets of flowers.

A light, well-drained soil containing lime is ideal. Propagation is by seed sown from September to October. Seedlings are transplanted when 5 cms high. The flowers are borne in spikes or racemes. The flowering duration can be prolonged by the removal of the spike when the flowers start withering.

Carnations: Dianthus Caryophyllus—Caryophyllaceae

Carnations have a wide range of colours. Yellow, pink, pure-white, deep-rose, pink, crimson and scarlet-red are some of the popular colours.

Carnations need a light, sandy, well-drained but not-too-rich a soil. The application of concentrated chemical fertilizers poisons the soil. Lime is beneficial. A sunny location is good. Propagation is by seed and layering. Seeds are sown in winter but not too deep. Dig shallow pits and fill with light sandy compost up to 1.25 cms of the rim. Sow seeds 6 mms to 12 mms apart. Spread a layer of light soil or compost to cover them and water lightly. Seedlings should be transplanted when about 7.5 cms high and spaced 22.5 cms to 30 cms in beds or planted singly in 20 cms to 22.5 cms. Staking is necessary. The stem of the *carnation* should not be buried deep. *Carnations* bloom within four months of the sowing of the seeds.

Carnations can also be propagated by layering. A stem should be cut through a joint and a pebble inserted. Leaves should be removed and the stem should be buried in light compost. Separate this layer from the parent after it has rooted well, pot it in a 10 cms pot and, later, transfer to a bigger pot. Disbudding is practised in order to obtain exhibition blooms. The comman practice is to retain only the centre crown bud which develops into a flower.

Pansy—Viola Tricolor-Violaceae

Known as *Hearts' ease, Pansy* is an object of garden ornamentation possessing a variety of glowing rich colours. It is ideal for growing in formal beds, borders, pots and bowls.

Nearly all pretty colours are found in giant Pansies. The *Pansy* has two sections, namely *Fancy* and *Show*. In the former, the petals are curled, flamed or blotched and there is a blending of various colours. In the section *Show*, the colours appear in a regular arrangement.

September to October is the sowing season for *Pansy* seeds. Sow in a light compost either in nursery beds or boxes or pots. Transplanting is done when four to six leaves have sprouted. Propagation is by cuttings and layering. Shoots taken from the middle of the plant and put in a light compost in a sheltered place will root readily. Layering is done for increasing the choicest varieties. The soil should be rich, well-manured, cool, moist and light. Cowdung mixed with sand helps healthy growth. An overdose of sunshine or shade is harmful to the plant. Exhibition blooms are obtained by keeping four or five main stems and pruning others.

Petunias—Fam: Solanaceae

Petunias are available in small and large-flowering varieties. The large-flower variety is in white, pale-rose, deep wine-red, light-purple, rich-pink, mauve, red, yellow, lilac, rose, salmon-rose, violet and scarlet. Some of the flowers are star-like, some are with fringed margins or blotches and markings and stripes, and some bear semi-double or fully-double flowers.

The seeds, being small, should be covered lightly with fine soil. Soil consisting of two parts of loam and one part of manure is suitable. Seedlings are translated when 7.5 cms to 10 cms high. Growing points should be pinched for inducing bushy growth. *Petunias* can stand a light frost but not a severe one.

Dwarf varieties are available. At first they are erect but gradually they become straggling types. They can be retained as excellent perennial ground covers.

Lathyrus Odoratus—Sweet Peas—Leguminosae

A native of southern Italy and Sicily, the *Sweet Pea* is popular for its graceful form, rich fragrance and vast variety of shades. The shades of the *Sweet Pea* may be classified into four broad divisions: blue to purple, pink, orange and red and white. A circular clump on a planting area five feet across should not have more than 25 plants. The root being four to five times the top growth, transplanting is very difficult. Planting of seed is, therefore, at site. Seeds should be sown 5 cms deep and about 16 cms apart in October.

A good deep loamy soil sheltered from the wind is ideal. A lime-loving plant, the *Sweet Pea* can never attain perfect growth in acidic soils. The land should be trenched. When planting in rows, the trench should not be less than a metre wide. Light soils can be made fit for *Sweet Peas* by the addition of cow or pig manure, superphosphate of lime and coarse bone-meal. For heavy soils, good farmyard manure plus basic slag and bone-meal is needed. All these ingredients are to be mixed thoroughly with the bottom spit of the trench. Keep the trench exposed for a fortnight. After that, all the manure, along with decayed leaves and remains from the vegetable patch, should be forked into the bottom spit over which should be piled 20 cms to 35 cms of soil. It should be sprinkled with a mixture on superphosphates and potash, in equal quantity, and the trench refilled up to 2 cms of the ground level. Sowing should be done on a dry day and the soil should be neither too dry nor too wet. Lime should be applied on the top spit using two to four ounces to a square metre. About a week before planting, give an application of four ounces of superphosphate or potash per square metre. Wood ash can be used when dry.

Young plants should be supported by twiggy branches later replaced by bamboo or wire netting when there is sufficient growth. *Sweet Peas* climb up with the help of tendrils. Pinching off may be done above the second pair of leaves as this leads to the development of strong basal shoots which, in turn, produce strong main stems bearing fine flowers. Liable to be damaged by winds, the brittle stems of the growing plant should be carefully tied up.

Manuring can be started before the flowers begin to colour. Suspend a bag of sheep manure in a tub of water and dilute the liquid by adding water till the resultant solution assumes the colour of very light tea. Washing the foliage with this water helps to maintain the vigour of the plant. Watering should be done in the evening. Nitrogenous manures should be used with restraint as the *Sweet Pea* is a nitrogen fixer. Application of lime and soot is useful in more ways than one. Apart from purifying the soil, lime helps the soil bacteria to perform their functions. Soot is also useful for improving the colour of the flowers and is a preventive against slugs and snails.

Flowers should be cut with long stems. Pulling damages the flowers. Place the cut flower with stem in water thus allowing the flowers to assume a firm texture.

For growing exhibition flowers the plants should be spaced 15 cms apart in rows 2 metres apart. As the seedlings grow, the strongest shoot should be trained and the other shoots removed. Often two strong shoots are retained on each plant. First buds will appear when the plant grows about a metre tall. Flowers that wither should be removed unless desired to be retained for collecting seed.

Papaver—Poppy—Fam : Papaveraceae

In delicacy, softness and variety of fascinating forms and shades, there are few annuals which can surpass the *Poppy. Poppies* are propagated from seeds which germinate quickly. Seeds are sown after the rains at site in a light soil, preferably sandy loam. *Poppies* bloom within two to three months of the sowing of seeds.

Papaver Somniferum is popularly known as the *Opium Poppy*. Opium is made from the milky juice extracted from its fruit. Its flowers are in shades of lilac, purple and white and variegated. The margins of the petals are wavy or cut artistically in different patterns. The petals however fall rather quickly.

Papaver Rhoeas, otherwise known as *Corn Poppy*, is hairy, growing to a height of 30 cms to 75 cms. The foliage looks highly ornamental. The flowers are long-stalked, 5 cms to 7.5 cms across, and cinnabar—red or scarlet with black spots. The well-known *Shirley Poppy*, with its wide colour range, is superior to all other poppies. *Shirley Poppies* are propagated by seed which should be sown in October at site. *Papaver Nudicaule* (*Iceland Poppy*) has foliage which is glaucous. The flowers are fragrant and the petals are either white with a yellow base or claw or lemon with a greenish base or claw. *Papaver Orientale*, otherwise known as *Oriental Poppy*, bears blooms of a scarlet colour. By crossing *Papaver Orientale* with *Papaver Bracteatum,* promising hybrids have been evolved which show a wide colour range. The popular colours are red, orange, soft-pink and salmon. *Poppies* are suitable for planting in beds, borders and pots. The cut flowers are very attractive for flower arrangements.

Lupinus—Leguminosae

Being free bloomers and bearing flowers on terminal racemes in colours of blue, purple, pink and white or yellow, *Lupinus* is one of the most showy annuals. It is ideally suited for planting in mixed borders. Its cut flowers are excellent for indoor decoration. Ordinary soil will do. The plant does not relish lime. Seeds are sown at site as the plants do not stand transplanting well. Soaking the hard-coated seeds for about 12 hours before sowing facilitates germination.

Lhupinus Luteus, (*Yellow Lupin*) bears yellow and fragrant flowers. It will bloom even in a poor soil. The plant is useful as a green manure too. *Lupinus hirsutus*, (*Blue Lupin*), produces purple blooms.

Callistephus Chinensis: Callistephus Hortensis—Fam Compositae

Also known as *China Aster*, this plant has gained popularity because of the diversity of its fascinating shades and forms, compactness of growth and free blooming character. The plant is adaptable to a variety of uses, viz., pot culture, cut flowers and for bedding purposes. White, lavender, blue, pink, mauve, salmon, scarlet and many other pleasing colour combinations are found in the various species of *Aster*. The asters grown in the garden as annuals belong to the genus Callistephus and not the genus *Aster*. The genus *Aster* comprises mostly of species of shrubs and perennials. There are branching types of *Asters* as well.

Asters produce flowers with or without quilled ray florets. The quilled section comprises of three types of *Asters*, namely, *Branching Asters, Ray Aster and Needle* or *Unicum Aster*, and the non-quilled types consists of six types, namely, *Comet Aster, Ostrich Plume* or *Plume Asters, Hohenzollern Asters, Victoria Asters, Chrysanthemum Asters* and *Paeony Flowered Asters*.

Relishing a rich loamy soil and an open situation, the numerous varieties of *Asters* are propagated from seeds sown from August onwards. *Asters* generally bloom within 3-4 months of the sowing of seeds.

Daytime Blooming Flowers

Venidium Fastuosum—Compositae

Venidium Fastuosum grows to a height of about 60 cms to 90 cms. Propagation is by seed. A sunny location and an ordinary soil are suitable. The stem is hollow and is covered with short white hairs. The leaf is greyish silky-white on both sides. The flowers are solitary. Each flower is 5 cms to 7.5 cms across, in some cases reaching 12.5 cms to 15 cms. The ray florets are orange and each petal possesses a purple-black zone at the base. The flowers close in the evening and reopen the next morning in the sun. In dull weather also the flower petals tend to close.

Mesembryanthemum Criniflorum: Aizoaceae

Mesembryanthemum is a stemless succulent. Popularly known as "Living Stone Daisy", this annual is a dwarf, growing only to a height of about 5 cms.

Propagation is by seed which should be sown at site. An open sunny location is necessary. The flowers are usually white and sometimes possess pink tints on their tips. The flowers are from 2.5 cms to 5 cms across. They are in the prime of their beauty as long as the sun's rays fall directly on them. The petals have a tendency to close in the afternoon. The plant is suited for hanging baskets, rockeries and as an edging plant.

Eschscholtzia Californica Papaveraceae

Popularly known as the "Californian Poppy", it is a perennial, cultivated as an annual. An ordinary garden soil and an open situation would do. Propagation is by seed to be sown at site. The seeds should be sown thinly in the open. The leaves arc long, petioled, three pinnatifid, the segments thus formed being linear. The flowers are large and saucer-shaped and are available in shades of cream, orange or yellow, showing variations. In dull weather, the flower petals close. The fruit is a 7.5 cms to 10 cms long pod.

It is an effective species for edging purposes and for front positions of borders. With its pretty bluish leaves, it is ideally suited for plantation in pockets in rockeries. It is also grown as a pot plant.

Dimorphotheca Aurantiaca—Compositae

Dimorphotheca Aurantiaca, otherwise known as the *Star of Veldt* is a very showy plant because of its bright orange flowers. Grown from seeds, it attains a height of about 23 cms. The branches are rod-like bearing linear-oblong foliage devoid of serrations. A light soil is relished. There are many attractive hybrids possessing a variety of brilliant colours viz. yellow, orange, white, salmon, apricot.

Gazania longiscapa: Gazaniopsis stenophylla

The plant attains a height of about 30 cms. The root stock is woody possessing short branches which can be increased by division. Propagation is by seed as well. *Gazania Longiscapa* is often grown in ornamental gardens for its golden yellow flowers which shine in the sun.

Arctotis grandis—Compositae

The plant is an annual producing profusely dazzling white or pale-bluish white flowers possessing mauve centres surrounded by very thin golden bands. Each flower is 5 cms to 6 cms across, shines in the sun, closes in the evening and reopens the next morning. It lasts for three to four days. It bears flowers well above greyish-green and toothed foliage and has a long blooming period extending for 3-4 months. The flowers are useful for cut-purposes. The annual is very effective for pots, beds, borders and rockeries. A sandy loam and a sunny dry situation are good. Propagation is by seed.

In *Arctotis Breviscapa* the leaves are cut irregularly and the flowers are borne on stalks which are shorter than the height of the foliage. The flowers of *Arctotis Gumbletonii* possess deep orange-red ray florets.

Annuals for Shady Locations

For shady situations nature has given us some very lovely flowers like *salvia splendens, cineraria* and *violets*.

Salvia Splendens—Labiatae

Salvia splendens, popularly known as the Scarlet Sage, attains a height of about one metre. The plant is shrubby in appearance with ovate and long-pointed leaves, both surfaces being without hair. The bell-shaped flowers are borne on 15 cms

Privacy in a Garden

Pergola

Backyard Flower Garden

A Beautiful Lawn

Sculptures from waste - Rock Garden, Chandigarh

Inviting Garden Paths

long spike-like terminal racemes in great profusion forming a huge mass of scarlet. The variety *alba* has creamy-white flowers.

Cineraria Cruentus—Compositae

Cineraria cruentus grows about 30 cms high and relishes a cool and moist atmosphere. The species has single and double flowering varieties. The plant is a herbaceous perennial and can be propagated by cuttings or division of the roots. However, it is generally cultivated as an annual and grown from seeds to obtain the best results. In order to get good seeds it is advisable to cross plants of merit or purchase fresh seeds from a reliable hybridizer.

The single varieties are more showy than the double ones. The popular colours in the single flower type are white, pink, blue, purplish and red. Double flower types are not generally grown because of the superiority in colour of single flower types. Double flower types, if grown, are raised from cuttings because when grown from seeds most of them are likely to turn single or not true to type.

Cinerarias should be planted in a soil comprising three parts of loam, one part of leaf manure, with the addition of charcoal and sand, and a handful of bone-meal to each plant. Such places in the houses as remain under constant shade but receive a free passage of air and diffused light can be beautified by the creation of grove effects with the help of *cinerarias*.

Violaceae

Violets are valued immensely for their delicate perfume. On this account its cultivation has assumed great importance. All the cultivated species and varieties of *violets* have been evolved from *Violet Odorata*—the *"Sweet Violet*".

Violets cannot stand heavy or cloggy soil. Loam and leaf-mould, mixed in equal parts, with some sand added, make ideal compost for the plant. *Violets* are propagated by seed, division and planting of vigorous offshoots in sand during winter. Seeds should be sown in a light and well-drained soil and seedlings transplanted to permanent sites when they are large enough. *Violets* are ideal for rockeries and slopes. They are good for pot-culture and on verandah steps.

There are single and double forms of *Violets*. Double forms are planted about 20 cms apart in rows at a distance of 25 cms from one another in extensive beds and look very impressive. For the single types, the distance from plant to plant should be 25 cms and, between rows, 30-45 cms. Weeds should be kept down and watering be done carefully.

To grow *Violets* in pots, the pots are filled with compost comprising of loam and leaf manure in equal parts up to 2.5 cms from the brim. The soil is then watered and allowed to settle down. Roots of *Violets*, not more than three in a pot, are planted firm and deep in the soil and are covered by a 25-mm layer of soil.

Annuals as Edgings

Many annuals serve very well as edgings to borders in sunny locations. A height range of 10 cms to 22.5 cms is ideal for providing edgings of annuals although those annuals which vary in height from 22.5 cms to 30 cms can also be quite effective as edgings to borders.

Examples of edging plants which relish a sunny and open location are given below.

Alyssum Maritimum—Cruciferae

Alyssum Maritimum, popularly known as *Sweet Alyssum* is a low-spreading annual attaining a height of about 10 cms. Propagation is by seed preferably to be sown at the required sites from September onwards. The leaves are light green, lanceolate and pointed towards the base. The flowers are snow-white or rich purple and when in full bloom form a dazzling sheet of white or purple.

Ageratum

Ageratum flowers retain their clear colours for a long time. Their blooming period is also long.

Ageratum Houstonianum is a half hardy annual growing to a height up to 60 cms. It has however dwarf varieties varying in colour and height.

Imperial Dwarf Blue is compact and grows to a height of 22.5 cms. *Blue Mink* bears powder puff-like blue flowers. The variety *Capri* is compact and mid-blue and the variety *Little Blue Star* is bright blue. All these grow 15 cms tall. Propagation is by soft-cuttings and seeds. An ordinary garden soil is suitable.

Mignonette (Reseda odorata) Fam: Resedaceae

Mignonette relish a rich medium light soil and a cool moist but not wet situation. It forms a very graceful edging to borders in semi-shady locations in warmer regions. In the cold regions, it can be planted in the open and in sunny locations but protection from the mid-day sun is essential in the initial stages. Stagnation of water at the roots is fatal. Soil consisting of two parts of loam and one part of well-rotted cow-dung manure, with the addition of charcoal and sand, is relished by this plant. Heat induces the early formation of seeds and hence shortens the blooming period.

A fragrant annual bearing white or yellow flowers, *Mignonette* is easily grown from seed. At first the plant is upright but later becomes the spreading type. The flowers are excellent for cut purposes.

Brachycome Iberidifolia Fam: Compositae

Brachycome Iberidjfolia, popularly known as the *Swan River Daisy*, grows 22.5 cms to 30 cms high. Propagation is by seed which can be sown in October in a light rich soil. This annual gives the best results if seeds are sown at site, and, if thinning is done so as to keep the-seedlings 22.5 cms apart.

There are three varieties of the annual—*Blue Star*, *Snow Star* or *White Star* and *Rosea* or *Red Star*, named after the colour of the flowers they bear. It takes about six weeks for the plant to flower. The blooming period is not long and as such successive sowings should be done. A sunny location is necessary. *Brachycome* is suitable for rockeries also.

Iber's Amara "Candytuft"—Crucieferae

Candytuft: It is also known as *Chandi Buti* because of the impressive white mass effect produced by the annual. The inflorescence is corymb which finally lengthens so as to become a raceme. Propagation is by seed which should be sown at permanent sites. Seedlings should be kept 15 cms to 22.5 cms apart. A well-drained, ordinary soil and a dry sunny location is ideal. Rose, Cardinal, Little Prince and Odorata are some varieties of the annuals. *Iberis Odorata* bears fragrant flowers.

Nemesia—Fam: Scorphul Ariaceae

Nemesia Strumosa: Plants which are likely to go beyond 22.5 cms may be pinched in the initial stage so as to keep them bushy, dwarf, and ideal for a edging plant.

Nemesia is a very charming annual, the corolla of which may be white, yellow, violet or of a variegated colour. This variety is not affected by adverse weather. Propagation is by seed which should preferably be sown at site. Seedlings should be spaced 15 cms apart. The variety *Suttonii* bears large flowers in many colours, viz., white, pale, yellow, orange, crimson, scarlet and blue.

Matricaria—Fam: Compositae

Matricaria Maritima is another dwarf annual growing within the height range 30 cms to 60 cms. The plants, likely to go tall, need pinching in the initial stages. Propagation is by seed. Ordinary good garden soil will suit it. The plant is smooth-skinned, the foliage is ornamental divided into thread-like segments and white flowers are borne in terminal heads. The variety *Plenissima*, is grown specially for its clear white double flowers which are useful for cut purposes. *Matricaria* prefers a sunny location but can grow even in a semi-shady situation.

Lobeliu Gracilis Fam: Compa Nulaceae

It grows about 30 cms high bearing deep-blue flowers on one-sided racemes.

Felicia Bergeriana (Fam: Compositae)

It is popularly known as the *Kingfisher Daisy*, is grass-like in appearance and produces bright blue blooms. *Felicia fragilis*, with pale violet flowers possessing a yellow disc, attains a height of about 10 cms.

Nemophila Insignis, Baby Blue-Eyes Fam: Hydrophyllaceae

It has clear blue flowers and grows 10 cms to 15 cms high.

Cotula Barbata (Fam: Composieae)

It varying in height from 7.5 cms to 9 cms and is compact bearing button like yellow flowers.

Gysophila Muralis (Fam: Caravo Phyllaceae)

It is a branching type with shorter joints. It grows into a densely shaped plant. It attains a height of 15 cms bearing rosy or white flowers with recurved petals. A sunny location and a dryish soil with lime present is ideal.

Seed collection of Winter Annuals

A flower produces fruit and seeds through processes of pollination and fertilization.

Flowers of good size, shape and attractive colour, should be selected for purposes of seed collection. The plant bearing the flower should be free of disease. A muslin bag is tied round the flower when it shows signs of withering away or in the case of pods and fruits, when their receptacles are about to burst. After the petals fall off, the seeds drop into the bag, and later, are separated from the flower dust. The name of the flower can be written on the bag for identification.

To be successful at seed collection, it is essential to understand the various modes of dehiscence of different seeds. Dehiscence is the natural opening of seed buds of plants for the discharge of seeds. According to the nature of dehiscence, some fruits are called “explosive” fruits and others “porous”. These are explained below.

The fruit of *Stock*, a fragrant winter season annual, is called a *Siliqua*—a name given according to the mode of dehiscence. The fruit is long and cylindrical.

In dehiscing, the two walls of the loculi break away and the seeds are found exposed on a structure called the septum. This is the time when the seeds are to be collected.

As a rule, cylindrical fruits are collected immediately after they are found swollen. They are then stored in wooden boxes or earthen pots. To collect seeds like that of *Dimorphotheca*, which can be carried away easily to appreciable distances by the wind, the fruit is plucked as soon as the "dry" wings of the seeds protrude. Sometimes, the seeds are collected while the fruit is still on the plant. In that case, the muslin bag should be tied at the top, lest the wind blow away the seeds.

The seeds of the *Sun-flower* have bristles at the top which facilitate their dispersal with the help of the wind. The fruit is called a *Cypsela* and the seeds are developed from the disflorets and not ray-forets. The seeds are rubbed out of the fruit after it has dried up. Seeds of *Sweet Sultan* and *Cornflower*, both of the family *Compositae*, can be collected as in the case of the *Sun-flower*.

In Violets and Pansy, (*Viola tricolour*) dehiscence takes place along the dorsal sutures of the fruit which opens out into a star-fish-shaped structure. On the central line of each piece are found embedded small, smooth, round and slippery seeds. The concave valves, by their contraction, throw out the seeds a considerable distance. In this case, the fruit is collected on ripening. The change of colour from white to brown along the dorsal sutures indicates that the fruit is ready for picking. The fruit is a capsule and the dehiscence is longitudinal. Because of the explosive nature of the opening of the fruits, these have been termed as the "explosive" fruits.

The *Lupin* is also an "explosive" fruit. The ripe-pods burst open suddenly, the two valves become twisted and the seeds are scattered. Due care should be taken to collect the pods before they burst. The pods are put in boxes in the sun. The pods will burst and the seeds will automatically be collected in the boxes. The fruit of *Alyssum Sweet* is very light. When the loculi open, the seeds are found exposed on the central placenta, one on each side.

The *Poppy flower* liberates the seeds through small pores at the apex. In this case, dehiscence is known as "porous" dehiscence. The capsules are to be collected for seed extraction purposes as soon as they are dry.

In *Sweet Peas*, the seeds are found attached on one side, when the pods open. Pods should be collected as soon as these are fully ripe.

The *Mignonette* is a plant with fragrant flowers. Its seed should be collected when they start turning brown. They should be spread on paper in a cool and a airy place, so as to dry. They should then be stored in paper bags. If the seeds are not collected at this stage and are allowed to ripen further, the seed vessel will burst at the apex, thus releasing and scattering most of the best seeds.

When fruits are collected for seeds, they should be allowed to remain exposed to the sun for a few days. Seeds are then sifted and stored in bottles. These bottles should be kept in a cool and airy place till required for sowing during the next winter.

Summer and Rainy Season Flowers

Summer Annuals

January to February is the time to prepare for the sowing of summer annuals which bloom from April to June.

The planting depth should be 6 mms for very minute seeds : 1.25 cms for seeds of *Gaillardia pulchella, Zinnia linearis* and *Gomphrena globosa* and 2.5 cms for seeds of *Portulaca grandiflora.* As a rule, seeds should be sown about 5 cms apart. For growing summer annuals in pots, transplant two or three seedlings of a height of 5 cms to 7.5 cms in 15 cms pots and, later, transfer the lot to 22.5 cms or 30 cms pots in order to get good flowering.

The more popular summer annuals are described below.

Zinnia linearis (Fam: Compositae)

It grows to a height of about 30 cms bearing bright golden-yellow flowers with light-orange margins. It is a very free flowering, neat, erect and bushy plant. The foliage is linear linoleate and dark green. The flowers are single and good for cut purposes. Propagation is by seed. A sunny location is desirable.

Zinnia Elegans (Compositae)

It is popularly known as *Youth-And-Age.* It grows to a height varying from 30 cms to 90 cms bearing sessile, ovate, heart-shaped foliage and 5 cms to 10 cms across flowers in a variety of hues. The colours are white, crimson, sulphur-yellow, buff and violet. It thrives in a loamy or sandy soil. Propagation is by seed. *Zinnias* are ideal for mass effects.

Cacalia Aurea (Compositae) and Cacalia Coccinea synonym Emilia flammea

It is popularly known as Tassel-*Flower* or *Flora's Paint.* It is a neat annual, growing to a height varying from 30 cms to 60 cms and bears lanceolate-oblong leaves and clusters of tiny scarlet or orange-scarlet flowers. Any good garden soil and an open situation suit the species.

Torenia Fournieri (Scorphutariaceae)

It is an erect, much-branched annual. It grows to a height of about 30 cms. The leaves are opposite, toothed, 2.5 cms to 5 cms long and the flowers, which are borne in racemes, are two-lipped. *Torenia* is good for planting in pots, in beds and along borders for a mass effect. Propagation is by seed and cuttings.

Salvia Farinacea (Labiatae)

Its seeds are sown in January. The plants bloom in the hot weather. The species grows to a height of about one metre. The leaves are lanceolate and oveatelanceolate in the lower region and linear lanceolate in the upper region. The violet-blue flowers are borne in a spike-like raceme. A rich soil is desirable.

Portulaca Grandiflora (Portulaceae)

It has many garden forms and has assumed popular names like the *Sun Plant* and *Rose Moss*. Prostrate or ascending in habit, it grows to a height from 15 cms to 30 cms. The leaves are hairy in their axils. There is a great variety in colour: white, yellow, red, purple and dark yellow striped. A rather dry, not rich soil and sunny location are desirable. Propagation is by seed which is sown directly at the site.

Portulaca Grandiflora and the other varieties are ideal for planting in the summer in large patches, as edgings and in pockets in dry rocks. These can also be grown in pots.

Gaillardia Pulchella (Compositae)

It bears oblong or lanceolate foliage. The disc florets of the flowers are acute or awned and the ray florets yellow at the top and crimson or rose purple at the base. The common garden form, which is under cultivation, is the *Picta* variety which produces tall plants and larger flowers.

Gomphrena Globosa (Amaranthaceae)

It is popularly known as *Globe Amaranth* or *Bachelor's Button*; has its home in India. It bears oblong and hairy leaves and small globular flower heads in attractive colours. The *Nana* variety is a dwarf one. It grows to a height of about 12.5 cms and produces dark-red flowers.

Annuals for the Rainy Season

Celosia

Celosias are grown as popular garden annuals in the plains.

Celosia looks very lovely with its numerous crested or feathered spikes of flowers in a variety of gorgeous and shining colours. It can be grown almost throughout the year.

Celosia Cristata, popularly known as the common *Cock's Comb*, -attains a height of about 23 cms or more. It bears compressed spikes of flowers in more than half a dozen velvety hues. The prominent colours are dark red, purple, crimson, yellow, violet, amaranth rich-yellow and crimson-scarlet.

There are crested and feathered types of *Celosias* belonging to tall and dwarf varieties. In the crested form, the compressed flowering spike assumes the shape of a curious-looking stiff crest, resembling the crest of a Cock's head. The taller varieties are suitable for borders. The dwarf-crested types of Celosias form ideal pot plants. The feathered types are very impressive for garden decoration and are therefore ideal for planting in beds and borders.

Seeds are sown 6 mms deep in March-April in a rich sandy loam in boxes or pans provided with good drainage. For pot culture, the seedlings should be planted individually. When the flower heads start showing, the plant exhibiting a thick crest of a bright colour should be transferred to 20 cms to 23 cms pots. Liquid manure twice a week is highly beneficial. The dwarf varieties take about three months to bloom and the tall varieties take four to five months.

Celosia Pyramidalis is a feathery type attaining a height of about 45 cms. The flowers are borne in dropping spikes and assume the form of a pyramid. The flowering spikes show a variation in form and habit and there is a wider colour range in this species than in *Celosia Cristata.*

Impatiens Balsamina

Balsam (Balsaminaceae)

Balsam is an Indian flower which has found its way into ornamental gardens in other countries on account of its gay blooms and pretty foliage.

Attaining a height of 45 cms to 75 cms it is half succulent and erect in habit. Flowers are very showy and borne in clusters. The semi-double or fully double varieties, the latter known as the *Camellia* flowered types, are grown in ornamental gardens. Dark blood-red, pink, mauve, red, yellowish and white are the popular colours. There are spotted and striped varieties also.

Seeds are large and germinate quickly. Seedlings are to be transplanted twice or thrice so as to get the best results. First transplanting is done when the seedlings are 7.5 cms in height. Liberal watering is essential. The flowers and leaves of *Balsam* plants appear to be wilted at noon but regain their form after watering in the afternoon. Watering twice a day is beneficial for *Balsams*. A rich sandy moist loam is ideal. Pinching is necessary so as to secure bushy and compact shapes. For obtaining exhibition blooms, a single stem only should be retained.

Seeds of the choicest and most perfect blooms of *Balsam* should be collected in time as the receptacles burst immediately on ripening. It is advisable to collect seeds, colourwise.

Tagetes (Marigold)—Compositae

Marigold is one of the easiest annuals to grow, is quick to bloom and is very effective for mass effect. The flowers come in golden yellow, yellow, orange and red. Added to this is that the flowers last in floral decoration schemes, garlands and bouquets. The flowers are in a large variety of forms and sizes. Borders planned with different forms and sizes of marigold look exceedingly fine. As pot plants too, Marigolds are highly decorative. The foliage of Marigold is pretty and, in some cases, scented. The size of the flower-head varies from 12 mms to 10 cms.

Marigolds are of two types: *French Marigolds* (*Tagetes Patula*) and *African Marigolds* (*Tagetes Erecta*).

Tagetes Patula, 30-45 cms in height is a erect, branching and spreading type. The plant is compact and bushy. There are single and double forms available in shades of pure yellow, orange and pure red and variegated. The variety *Nana* is dwarf and ideal for edging purposes. *Tagetes Ereota*, about 60 cms high, is the common Marigold of ornamental gardens. Seedlings are planted about 45 cms-apart. The foliage is very strongly scented. Flowers are fully double, being two to four times larger than the *French Marigolds*.

Tagetes Signata, Striped Mexican Marigold, is 45 cms high. The variety *Pumila*, 30 cms in height, is compact, bushy and dwarf with small bright yellow flowers borne in great profusion. It is ideal for massing in borders.

Cleome—Capparidaceae

Cleome Spinosa, Cleome Lutea and *Cleome Speciosissima*, three species in the genus *Cleome*, are worth growing in ornamental gardens. They are impressive in flower beds, borders, as clumps in rockeness and in pots.

A light rich soil and a warm situation are good for them. Seeds may be soaked in water for two hours before sowing. For pot culture, seedlings are to be planted singly in pots. Plants propagated from seeds will take about three months to bloom. For planting in beds or borders, seedlings should be spaced about 60 cms apart.

Amaranthus—Fam: Amaranthaceae

This showy flowering and coloured foliage species is grown in sunny locations in a rich loamy soil in sub tropical areas. Propagation is by seed which should be sown from March to April. Seedlings are transplanted when 25 mms high.

Popularly known as Love Lies Bleeding, *Amaranthus Caudatus* looks very graceful with red tail-like dropping panicles which equal the height of the plant. It is a free flowering species. The variety *albiforus* bears white or greenish-white spikes and the variety *atropurpureus* bears blood-red foliage. There is also a variety bearing yellowish blooms. The plant takes about three months to bloom.

Amaranthus Salicifolius is a very beautiful foliage species of pyramidal habit bearing bronzy-green foliage which turns orange-red later.

Amaranthus Tricolor, about 45 cms in height, has an interesting combination of three colours in its foliage. The tip of each leaf is green, the upper half is bright yellow and the lower part dark crimson or purplish-red. *Amaramhus Splendens*, *Joseph's Coat*, combines admirably pretty foliage and attractive flowers. The leaves are variegated in brilliant colours of yellow, red brown and green and the flowering panicles are shining red.

Cosmos Sulphureus—Compositae

With its lovely large flowers in shades of pale yellow, pure yellow or golden yellow, *Cosmos Sulphureus* is in its prime in the rainy season. Its cut flowers are excellent for table decoration. The annual is ideal for planting in beds, by itself, or in mixed or herbaceous borders.

Seeds should be sown at site and the seedlings be thinned out so as to keep them 45 cms to 60 cms apart. Watering has to be copious in case the rain is scanty.

Cosmos Sulphureus takes about three months from the sowing of seeds to come into the flower bearing stage.

Vinca—Apocynaceae

Vinca is popularly known as *Sada Suhagun* in North India because of its perpetual bloom. As it needs more water than other varieties, the rainy season is ideal for its cultivation as an effective annual.

Vinca Rosea, suited to tropical areas, attains a height of 30-60 cms. The stem in hairy, the leaves are smooth-skinned and the flowers are rosy-purple. Flowers are borne prolifically. There is a white variety also known as *Alba* which, in full bloom, forms an impressive sheet of snow-white flowers. As the flowers always remain open, *Vinca Alba* can be introduced in schemes of moonlit night gardening.

A soil consisting of well decomposed compost and well decayed manure is suitable. Propagation is by seed to be sown from March to April in a sandy soil.

Vinca Rosea is good for planting in beds or in herbaceous borders.

It also forms a nice decorative pot plant. Seedlings should be first transplanted into pots when they have developed two leaves. From there, the seedlings should be transplanted to bigger pots of 20 cms to 30 cms size when they have developed six to seven leaves. The soil should be a sandy loam.

Garden Colour Schemes

Planning colour schemes in a flower garden calls for imagination. No hard rules are laid down.

Flower beds can be designed in many shapes-circles, ovals, rectangles, squares, triangles, crescents and stars. Whatever the form, clear lines and correct angles enhance the beauty of the beds. A simple shape is preferable.

Flowering plants should be planted in such a way in the beds as to give a harmonising effect. Clashing and contrasting colours should be avoided, except for edging purposes. Do not use a continuous line of one kind of flower for edging or other parts of the borders as these breed monotony. A patchwork colour effect should be avoided in borders. Groups of flowering plants should be of irregular shape running into one another, as naturally as possible. Where the ground is a dark green carpet of grass, one has to divert the attention from the ground to the flower borders.

Do not put the brightest shades at the starting point of the border as these will eclipse the beauty of the paler shades. While planning a border, start with paler shades which should be followed by darker ones, which again should give way to paler shades, in a gentle descending order from the point of brightest shade.

Use of white with restraint for edging purposes at a few places will brighten the border. The plants in the border should bloom simultaneously.

Herbaceous Borders

An ideal herbaceous border is one which gives a continuous crop of flowers from spring to autumn. Different plants are so arranged that the various colours of flowers blend harmoniously. A special quality of a herbaceous plant is that even if its stem is cut down to ground level, it regains activity and blooms the next season.

Herbaceous borders require at least 60 cms depth of good soil, a sunny aspect and shelter from wind. The soil should be well drained and be capable of retaining moisture without becoming stagnant. Plenty of humus, a tolerably liberal dose of phosphate and an application of lime form the essentials of the manurial treatment. The width of the border should not be less than four and a half metres.

Herbaceous borders are of the following types :

Purist or Thoroughbred: Perennials of a hardy character with perennial roots and annual stems are included in this. *Mongrel*: Evergreen shrubs or small trees are provided along with the formal edging of some other plants. *Formal beds*: Plants like *Lupins*, *Larkspurs* and other annuals are planted in clumps.

Herbaceous borders of the first two types are best seen from one side only. The plants are so arranged as to give the impression of a slope : dwarf plants in front and tall ones at the back, with a wall, a shrub or a hedge in the background. Such borders are designed to hide portions of the kitchen garden or other such objects.

Borders Suggested

In early spring arrange bulbous plants like Lilies, especially *Hippeastrums*, in different shades, followed by *Lupins* and *Larkspurs* at the back and *Eschscholtzia* in front, with *Euphorbia Pulcherrima* in the background. In summer and the rains, arrange *Zephyranthes* plants followed by *Jasminum sambac* (*motia*) and *Jasminum flore-pleno* (*mogra*) in the middle and *Jasminum auriculatum* (*joohi*) in the back, with a background evergreen hedge of *Muraya Exotica* (*kaminee*). In winter, a mixed border of annuals starting with *Candytuft* followed by such bulbous plants as *Narcissus, Daffodils, Tulips* and tall annuals such as *Hollyhock* should form the background.

Winter annuals can be used for borders in sunny and shady locations. These will bloom till spring. For shady locations the choice is limited to *Salvia Splendens, Violets* and *Cineraria.* For sunny locations there is no dearth of seasonal flowers. The most popular among them are *Hollyhock, Dahlia, Sun-flower, Sweet Sultan, Clarkia* (tall ones), *Antirrhinum, Linum, Gypsophila Lupinus, Carnation* (medium-sized) *Pansy, Candytuft, Alyssum* and *Ageratum* (dwarf variety).

Choice of Annuals

Some annuals like *Dimorphotheca, Mesembryanthmum* and *Arctotis* open up only in the sun. It is, therefore advisable to have in the border in sunny locations only such annuals as do not have the tendency to close in dull weather. Extensive borders of seasonal flower can be provided along garden paths in ascending or descending order. Colours can be mixed or borders of separate colours can be planned. In all these cases, a very low border of flower plants like *Matricaria, Brachycome* and *Nemesia* is advisable.

Given below is a combination for a 17-metre-long border of seasonal flowers.

Annual Chrysanthemum	*Helichrysum*	*Cosmos* (white)	*Dahlia* (red)	*Cosmos* (orange)
Larkspur (white)	*Antirrhinum* (deep pink)	*Larkspur* (blue)	*Lupin*	*Poppy* (scarlet)
Antirrhinum (yellow)	*Petunia* (mauve)	*Dimorphotheca*	*Dianthus*	*Arctotis* (white)
Brachycome	*Candytuft*	*Phlox* (deep pink)	*Eschscholtzia*	*Pansy*

This border can be bounded at the back by an evergreen hedge of *Murraye Exotica* which will produce fragrant flowers during summer and the rainy season when the border itself is without flowers.

Planning for Festivals

Flower borders for festivals such as the Basant can be planted with annuals which will bear yellow flowers in profusion at a particular period making the season colourful and gay. Plants for festivals are numerous, in all sizes and varieties, such as the *Dahlia, Helichrysum, annual Chrysanthemum, Sweet Sultan, Double Sun-flower* and *Single Sun-flower, Antirrhinum* (yellow), *Dimorphotheca* (deep orange), *Eschscholtzia* and *Pansy.*

Festivals can be made colourful with the help of flowering plants. During festivals, drawings and paintings in colour keep the children and housewives busy. How fascinating it would be if the colour schemes are done in flowers also. A copious supply of the following flowers can be had in November and December.

Cosmos (orange)
Celosia (mixed)
Balsams (Double pink)
Cosmos (white)
Sun-flower (white)
Balsams (red)
Vinca (mauva)
Vinca (white)
Gomphrena
Rose (deep pink)
Hedge Rose (white)
Zinnia linearis
Balsams (dwarf)
Gaillardia (double (brown)
Verbena erinoides

Sowing of *Balsams* and *Celosia* can be done late in June so as to have them in flower in October or November. Most of the other plants are perennials.

Jasminum Sambac (*motia*), *Jasminum Sambac florapleno* (*mogra*), *Artabotrys Odoratissimus* (*Hari champa*), *Jasminum Grandiflorum* (*chambeli surkh*), *Jasminum Bumile* (*zard chambeli*), *Spiraea Cosymbore Galphimiaglance* and herbaceous plants like *Asclepias Curassavica, Ruellia Indica* and *Heliotrope* are ideal for border purposes. Developing foliage in contrasting colour should be considered while planning borders. Some foliage plants which can be used to produce such an effect are *Acalyphas, Sanchesias, Coleus* and *Crotons.*

An exquisite border can be had by planting tall chrysanthemums in the background and medium and dwarf varieties in the middle and front lines. Another way is to have tall chrysanthemums in the middle and two lines of medium varieties on either side followed by two rows of dwarf. The colours can be chosen blockwise or an assortment can be had. If planting is done in August, a chrysanthemum border will be in full bloom by November-December, when there is generally a dearth of flowers in the garden.

In the small home-gardens of today, a separate area for roses is not possible. Mixed borders of shrub roses, strong hybrid teas and floribunda roses is gaining popularity. The advantages are, firstly, variety and secondly, the elegance of the border is maintained almost throughout the year through flowers which bloom at different periods. For example, an excellent border can be had by planting in the background *Juniperus Chinensis* (which has a good spread of foliage right from the base) and roses like Mc-Gredy, Sunset and Queen Elizabeth and summer-blooming shrubs in the front. The front-line can be bounded by a low-growing evergreen lily like Zephyranthes Grandiflora which is in bloom during rains.

For borders of chrysanthemums, shrubs, roses and herbaceous plants, the soil should be dug up one metre at least and planting done in August. For borders of seasonal flowers, the soil should be dug up to about 30 cms. Sowing time is September to November. Maintenance is easier and cheaper if hardy perennials are used in the border. It is costly if plants like Dahlias and Annuals are used, though the display of colour is better.

V

Bulbous Plants

BULBOUS PLANTS are popularly known as lilies. They grow in a variety of soils and under varied conditions. This delightful flower brightens up with its pleasing colours a garden either in the plains or in the hills.

A number of bulbous plants can be sown in February in order to obtain gorgeous blooms during summer and the rains. There are others, the bulbs of which can be sown in August or September so as to have a lovely splash of colour in winter and spring. They can be grown in decorative pots, beds, borders and hanging baskets. The advantage of growing them in borders, in beds, in ornamental gardens and in clumps in rock rockets is that they can be allowed to remain at site after their flowering is over, in the case of evergreens as well as of deciduous plants.

The evergreen bulbs will keep up the elegance of the spot throughout the year and the deciduous types, on the inception of favourable weather, will awaken to life and restart their flowering cycle. Thus, the expenditure on maintenance is reduced considerably.

Bulb Plants for Summer and Rainy season

Cipura paludosa (Iridaceae)

Cipura paludosa, a very delicate plant with pretty leaves and exquisite night-blooming white flowers, is deciduous. It is ideal for growing in low bowls, hanging baskets and in rock pockets. It is very well suited to window gardening.

A native of Guiana, the plant grows well in a soil consisting of sandy loam, peat and leaf soil. Propagation is by seeds and offsets. The seeds should be sown in spring. The bulbs which are roundish-conical should be planted 2.5 cms. deep, after the division of the offsets, during spring. The bulb will germinate and leaves will rise from its base. Watering is to be done sparingly till the bulbs sprout and, thereafter, copiously. The leaves are radical, linear-to-lanceolate, 7.5 cms. to 15 cm long and form a sort of rosette. The scapes bearing the blooms rise from amidst the rosette but are shorter than the leaves. Flowers are borne on densely-imbricated terminal spikes. They open in the afternoon in the Delhi climate and close by early night. The main flowering season is May to June.

Watering at the flowering stage should be reduced and the plants should be kept moderately dry. Gradually the leaves will start showing colour, turn yellow, wither and die. The bulbs can then be lifted after a few days, divided, dried, stored and re-sown in spring. They can even be allowed to remain in the ground.

Strelitzia reginae (Musaceae)

Popularly known as the "Bird of Paradise Flower" or the "Birds' Tongue Flower", *Strelitzia reginae*, a rhizomatous plant produces alluring plantain-like leaves in a fan-shaped form and peculiarly-shaped flowers.

Strelitzia reginae relishes a shady locale and a well-drained gritty soil, comprising two parts of good loam, one part peat and a little of sand and charcoal. Easy to increase by dividing the rhizome, the plant needs to be watered liberally during summer but is to be kept towards the drier side in winter. Propagation is also by seed. The seeds should always be sown in a light soil which should be kept moist. Warmth should be available at the bottom. The plant grows about a metre or a metre and a half high with large-stalked oblong and 30-cm-long concave leaves.

The flowers look exquisite in charming colours of orange and blue-purple with keeled sepals and dissimilar petals. They are borne in summer in the plains of North India on horizontal 15-cm-long purplish-based spathes each spathe carrying about half a dozen flowers on it. Planted in a boat-shaped enclosure, *Strelitzia reginae* is ideal for placing in the verandah or even in a room at a suitable spot. It brightens rockaries.

Strelitzia augusta grows to a height of two metres, the leaf blade being a metre long and of a brilliant-green colour. The flowering spathe is of a pleasing purple colour. The outer and inner flower segments though of different sizes are white.

Hippeastrums (Amaryllidaceae)

The plant is in full bloom in early summer in fascinating colours, viz., white, crimson and blood-red. Many a hybrid variety possesses beautiful stripes. Bulbs can be sown in February, 10 cms.-15 cms. deep in a light rich soil and a semi-shady-to-sunny location in pots or in beds.

Hippeastrums forms an ideal decorative pot plant in summer and can be made use of in a variety of situations such as on the varandah and porch. Extensive beds, borders of this lily present a wonderful show. They can be planted in small formal beds in a home garden or in pockets in rockeries with a compact bush planted on the highest point of a grassy mound so as to provide shade in summer and sitting place underneath. Hippeastrums planted on the mound up to the ground level will present a delightful picture when in bloom.

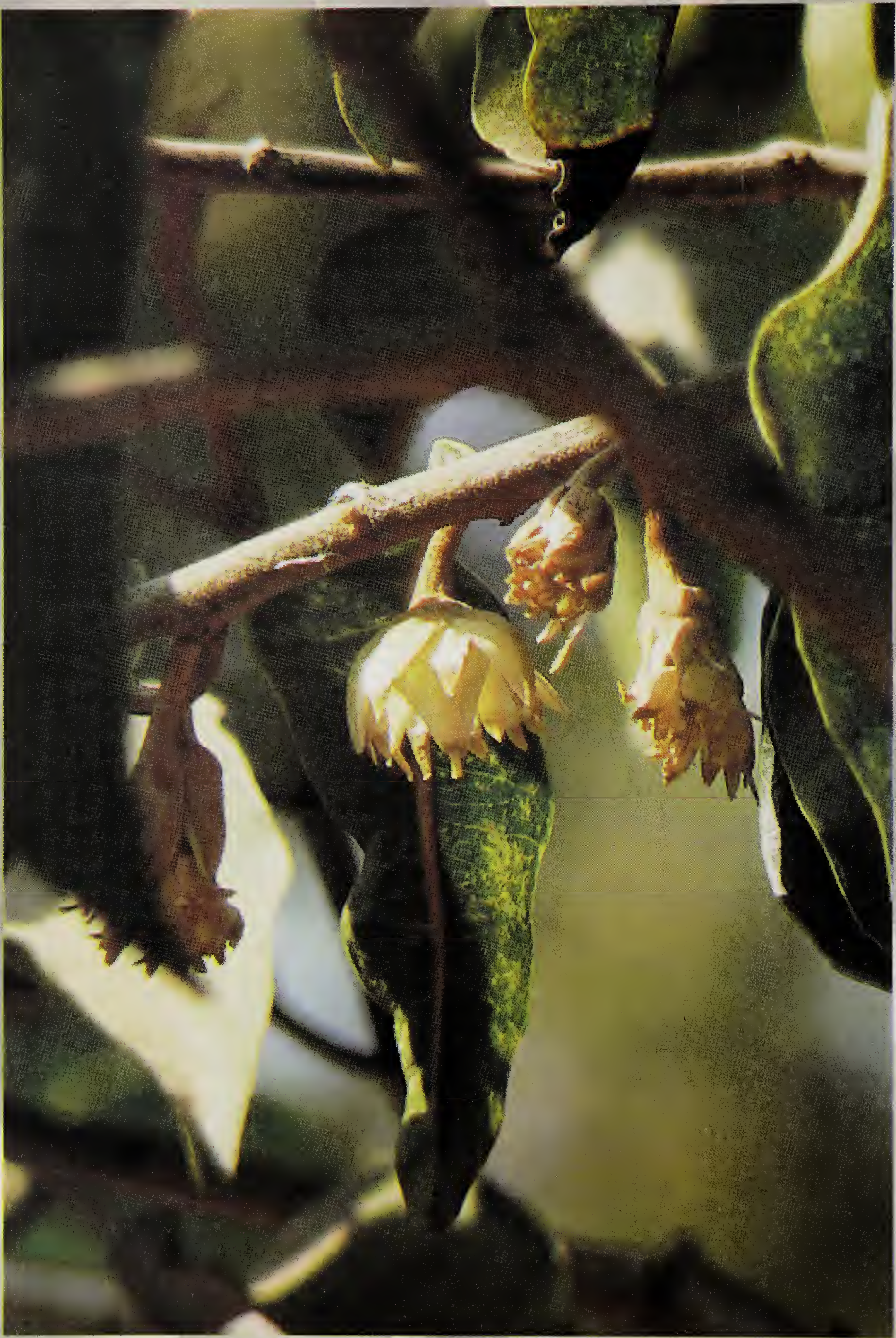
Cassia

Cycus

Coleus

Bauhinia Variegata

Dieffenbachia



Mimusops Elengi

Haemanthus multiflorus (Amaryllidaceae)

Bulbs of *Haemanthus multiflorus* popularly known as the "Football Lily" can be sown 5 cms-to-6 cms deep from February to March. Football-like globular heads of blood-red flowers appear from April to May. A light soil with the addition of charcoal is good. Watering is needed in plenty during the growing period. The "Football Lily" is excellent for pot culture. There is a special variety known as *Haemanthus candidus* which bears white flowers. In the variety *superbus*, the colour of flowers is brighter than in *Haemanthus multiflorus*.

For this plant, the soil should be kept moist though not wet, after the planting of bulbs. Watering should be copious once the bulbs throw out new leaves. The application of liquid manure is useful.

Liriope graminifolia (Liliaceae)

This is an ideal plant for bowls in window gardening and hanging baskets because of its lovely purplish blooms and beautiful thin foliage. A sandy soil and a shady location are desirable. Propagation is by division.

Liriope graminifolia grows to a height of 30 cms or more. The leaves are radical, grass-like linear-lanceolate and 15 cms-to-30 cms-long. The flowers are borne on 15 cms-to-30 cms-long spike-like racemes in groups of three to five along the scapes which over-top the foliage. Each flower is about 1.25 cms across and the colour varies from violet-purple to white. The perianth is segmented and almost bell-shaped. The flowering starts in March in the Delhi climate and it continues up to the end of the rainy season. The fruit is a berry.

Polianthes tuberosa (Amaryllidaceae)

Polianthes tuberosa, commonly known as "Gul-i-Shab-Boo", more or less a perpetual bloomer in Bangalore, is at its best in a climate like that of Delhi during late summer and the rains. The plant grows to a height of about one metre. The flowers are highly-fragrant, white, single or double.

A semi-shady to a sheltered sunny location is needed. Propagation is by tubers to be planted about 4 cms deep and 15 cms apart, during spring, in the plains of north India and any time during the year in Bangalore. In the plains, the tubers planted during winter will sprout with the inception of spring and can produce a crop in summer.

The flowers are good for flower arrangements and making garlands and bouquets.

Costus speciosus (Zingiberaceae)

This plant is popularly known as the "Spiral Flag". Grown from rhizomes planted from March to April in a rich sandy loam and a semi-shady location, *Coitus speciosus* produces snow-white flowers throughout the rainy season in the plains of north India. In Calcutta it blooms prolifically in swampy and marshy areas. The leaves are fleshy and velvety to touch, on the under sides, and the flowers with marginally-fringed petals are very delicate, membranous and surrounded by reddish bracts. This rhizomatous plant sheds leaves during winter and reawakens to life in summer, if it is not disturbed. The foliage and flowers are effective for flower arrangements.

Zephyranthes (Amaryllidaceae)

This is a tiny flowering plant ideal for edgings to borders during summer and the rains. It is available in white (*Zephyranthes candida*), rose (*Zephyranthes carinata*) and yellow (*Zephyranthes aurea*). The bulbs can be planted from February to March about five cms deep in a loamy soil and in a sunny to semi-shady location.

The foliage is grass-like, evergreen and keeps up the elegance of the spot even when the plants are not in bloom. Planted in bowls, the plants are highly decorative. The plant is ideal for use for a variety of situations.

Montbretias (Iridaceae)

Montbretias bloom to full majesty in the rainy season in the plains of North India. There are numerous hybrids of *Montbretias* under cultivation with a variety of attractive shades. Prominent among them are hybrids in crimson, scarlet, yellow, maroon, golden, coppery-orange, apricot-yellow and soft orange-yellow with beautiful botches on the petals or in the heart region of the blooms in a variety of fascinating patterns. Cut flowers last over a week in vases.

Montbretias are grown from corms to be planted 7.5-cm-to-l0-cm-deep and 10-cm-to-15-cm apart in compost consisting of two parts of peaty loam, one part of leaf mould with the addition of sand. Attaining a height of 60-cm-to-120-cm, they produce spikes of flowers throughout the rainy season. The flowers look like *Gladioli* in miniature. Watering should be withheld towards the end of the rainy season when the flowering is over.

With the leaves dying in course of time, the corms could be either lifted and stored for replanting the next season or they could be allowed to remain intact in the beds, where they will re-awaken to activity at the inception of the warm weather.

Montbretia laxifolia syn Montbretia strictifolia and *Tritonia clusiana*, 15-cm-to-60-cm in height, produces flesh-coloured blossoms on 15 flowered spikes.

Montbretia flava, 30 cms, bears yellow flowers on one-sided spikes. The "Apricot Queen", the "Indian Chief" and "His Majesty" are very popular and promising hybrids. In "Apricot Queen", apricot and yellow colours blend magnificently, and the "Indian Chief" has large flowers which exhibit tints of copper, orange, crimson, maroon and golden yellow. The large-sized blooms of "His Majesty" depict shades of scarlet, crimson and yellow.

Hymenocallis caribaea (Amaryllidaceae)

A charming lily blooming to perfection in the rains in tropical and sub-tropical areas, *Hymenocallis caribaea* is popularly known as the "'Spider Lily".

Hymenocallis caribaea is a moisture-loving plant. A soil consisting of two parts of peat and one part of leaf manure, with addition of sand, suits it. It needs a semi-shady or a sheltered sunny location. Propagation is by bulbs which are globose. Watering would be liberal at the roots especially during the growing season. In two or three years, an excellent bushy clump is formed from a single bulb.

The leaves, which are 12 to each bulb and in several ranks, are large, dark-green and linear-to-broad, linear and narrow at the base. The flowers, usually many, are borne in an umble-type inflorescence on the axis of the scape. The perianth consisting of six segments in two whorls is generally united behind, into a long narrow tube and is petaloid. The flowers are enclosed in a spathe of one or more leaves. This spathe is carried over the inflorescence axis called scape. This scape which is solid attains a height of 60-cm-to-90-cm or more. Young flowers are borne towards the outside, i.e., away from the centre. The term centrifugal is used for this arrangement.

The flowers are snow-white and exude an appealing mild 'fragrance. The attractive structure which is located within the flower is known as the "corona". It is associated with stamens as a continuous membrane thus forming a staminal cup. The stamens, which are six in number, appear to rise from the edges of this staminal cup. The "corona" may be toothed and fringed in a variety of ways.

The flowering of *Hymenocallis caribaea* is at its best in the rains. The opening of flowers is irregular. The flowers open late in the evening. Before opening the flower forms the shape of an umbrella. The segments then burst and open into an expanded flower which resembles the shape of a spider. Insects belonging to the order *Lepidoptera* visit flowers after darkness in search of honey. These insects cling to the heart of the flowers and thus damage their shape. The delicate "corona" is disfigured and torn by these insect activities. By dawn, the insects fly away. The viewer is surprised that beautiful flowers blooming to grandeur the previous evening are in ruins the next morning.

The plant flowers for a number of years, if not disturbed. Clumps could, however, be lifted during spring or the rains, divided and each piece put in at the required sites for new plantation. The plant looks gorgeous when set in an artificial rockery, along the bank slopes of an irregular stretch of water, in perennial herbaceous borders or in pots for decorative purposes.

Hemerocallis (Liliaceae)

Popularly known as the "Day Lily", *Hemerocallis* is in its prime of beauty from May to August. The flower closes its petals in the evening and re-opens them during day-time. Hence this name. The individual flower is, however, short-lived. Clumps of fleshy roots are planted about 30 cms apart at intervals of one week from February to March. The "Day Lilies" are so hardy that they grow with ease in dry areas, moist situations and marshy and slopy areas.

Blooms appear on the same flowering scapes in succession. "Day Lilies" are borne on 60-cm-90-cm-long scapes in glowing colours of orange and yellow. An open semy-shady-to-sunny location is good. "Day Lilies" are excellent for herbaceous borders or in separate bed in themselves. They form nice decorative plants, too. The flower looks impressive in floral decorations during day-time.

In *Hemenocallis dumortier* (syn. *Hemenocallis rutilana*), the scapes are 45-cm-to-60-cm-long and the flowers are rich yellow on the inside and bronzy-yellow outside. *Hemenocallis flava*, known as the "Lemon Bay Lily" is at its best with lemon-yellow and fragrant blossoms on 90-cm-long scapes, in May and June, in the hills and plains of India.

Bulb Plants for Winter and Spring

Gladiolus (Iridaceae)

With its pretty foliage and lovely flowers in many graceful forms, the *Gladiolus* is indispensable for an ornamental garden. Like the rose, *Gladiolis* offer a very large range in colour: white, crimson, pink, orange, salmon, red, scarlet, purple, cream, apricot, and cherry-red. The numerous species can be broadly categorised as "The Exhibition Types", "The Large Decorative Types", "The Small Decorative Kinds" and "the *Primulinus* Types" in dwarf, medium and tall sizes. The *Primulinus* class is also known as "Waterfall Gladioli" because originally they were located near the Victoria Falls in Africa. Flowers in this class are hooded, soft and refined. The leaves in this variety of Gladioli are sword-shaped. This variety, therefore, has been given the popular name of the "Sword Lily" or "the Corn Flag".

The *Gladiolus* which has the quality of combining admirably with other garden flowers has made itself superb for planting in borders. For growing large-flowered *Gladioli* in pots, put one corm in a 20-cm pot and for the dwarf types one corm in a 15-cm pot. When planted in beds, by themselves, colourwise, a delightful mass colour effect is produced.

Corms can be planted 7.5-cm-to-15-cm-deep through drills, about 37 cms apart in a well-drained light rich sandy loam, during October and November in the plains and in February and March in the hills. Staking is not required where the planting is done deep. For large-flowered types, supports are absolutely essential. Big-sized corms will take two and a half to three months to bloom. By planting corms of *Gladioli* in the month of February in the Delhi climate, in a cool and semi-shady position, a lovely crop of blooms can be had in the month of May and onwards. A sunny location is best. Copious watering and full sunlight are needed during the growing period. Application of liquid manure is very useful from the time the bud forms till it shows colour.

The application of superphosphate at the rate of two to three kilos in a length of 33.5 metres and wood ash at the rate of one handful to each plant will result in a prolific crop of better-quality blooms.

When the leaves wither and die, the corms should be lifted, dried, graded and stored. During storage, scatter naphthalene flakes at the rate of an ounce to one hundred corms. After about four weeks, remove them from the corms so as to ensure that thrips are not carried in the corms, as they may create havoc by eating up the corms, foliage or flowers.

The number of varieties of *Gladioli* is more than 3000 with the parentage of a vast number being unknown. Selection of these varieties may be made keeping in view the early and late flowering characteristics, besides consideration of good form and, bright or soft pleasing shades.

Gladiolus colvillei is an early flowering species and one of the oldest garden *Gladioli* in cultivation. The flowers are open, brilliant scarlet with the bases of the lower segments blotched. The flowering spikes are short. There are numerous attractive varieties in this species.

Gladiolus gandavensis, Gladiolus nanceianus and *Gladiolus lemoinei* are the late flowering types.

Gladiolus gandavensis is the old-time garden *Gladiolus* in which the predominant colours are red and yellow with streaks present. *Gladiolus nanceianus* has fully open and large flowers in glistening colours of red and purple the plants being robust, open and spreading.

Gladiolus lemoinei : In this variety there is a predominance of yellow, red and purple shades. The upper segments are horizontal or hard-hooded, the lower ones blotched purple and the wrolea is almost bell-shaped. As the stems are a bit hard, the flowers do not open out so well in vases as in varieties with tender stalks.

The cut flowers possess great lasting quality besides bringing about a picturesque effect in schemes of interior decoration. For using flowers for interior decoration, *Gladioli* spikes should be cut when only their lower flowers open, thus enabling the remainder to blossom out in the vases. Cut *Gladioli* look most charming with their own foliage. The lower ends should be removed each day.

Cannas (Cannaceae)

With myriads of fascinating shades and with stately postures, Cannas provide a feast to the eyes throughout the year in a tropical or sub-tropical home or public garden.

Trussel flowering and *Orchid* flowering are the two important groups of *Cannas* blooming almost throughout the year in tropical areas. In the former, the flowers open together proving superb for the display of a mass colour effect whereas in the latter, the flowers do not open together. Both the types show a variation in height in their several species thus providing the gardener with a wide choicet of plants for colour and size.

In *Cannas*, it is the stamens which are petaloid and colourful. A *Canna* flower thus affords a botanic curiosity.

Cannas are gross feeders enjoying a light rich moist soil which should be dug up to a depth of one metre. The soil should be enriched with manure at the rate of one cartload for a bed of 5 metres × $1^3/_4$ metres. Rhizomes, cut into 15-cm-long pieces, each possessing a bud or two, are planted half-a-metre apart in rows located at a distance of one metre from one another. This should be done in the later part of June so as to avail of the first shower of rains in July. A layer of sand is spread over them and they are kept moist till growth starts. Thereafter, the watering should be copious. The application of liquid manure is beneficial during the growing period.

Flowering will start in October. By pulling out the flowering branches to the ground level as soon as the flowers start withering, the other branches can be made to put forth their blossoms. The plants are thus constantly in bloom.

Manuring is done in October and January so as to have lovely blooms up to summer. The work of re-doing *Cannas* is then to be taken in hand. Watering is withheld in the middle of May, the rhizomes are dug out 15 days thereafter, the beds are treated and *Canna* rhizomes are divided and replanted for next season's gorgeous flowering.

Canna indica is red or rose. The upper portion of the colourful petal-like stamens is bright red and the lip is red-yellow possessing red dots. *Canna flaccida* is sulphur yellow with each flower possessing a large yellow lip. *Canna speciosa* is bright red with a yellow lip possessing purple spots. *Canna latifolia* is brick-red with the stamens uniting so as to form a tube. *Canna liliiflora* is white and fragrant. These are the more promising species worth growing in ornamental gardens.

In *Canna indica variegata*, the foliage is striped green and yellow making it a very unique plant. The flowers are yellow. The plant needs a moist and sheltered place.

For pot-culture, dwarf varieties should be preferred and two rhizomes should be planted in a 42-cm pot.

VI

Climbers

THERE IS no better gift of nature than climbers which flower for beautfying cities and for transforming the landscape of suburban and rural centres alike. Combining luxuriant greenery with profusion of pretty flowers, climbers alter the look of any landscape. Some of the most popular flowering climbers ideal for various seasons are mentioned below.

Thunbergia Grandiflora

One of the densest creepers, it climbs to a great height. By training and thinning it can be kept within required limits. The leaves are heart-shaped, dark green on top and light below. Both surfaces are rough and the underside is hairy. The flowers are very large and pale blue. The petals are deep blue before opening but later turn pale. The tubular part of the flower is white and there are two broad sepals at the base. The variety *alba* produces white blooms. Ideal for covering screens and for making shady pergolas, it is evergreen. If a tree has dried in the garden or it has become lop-sided as a result of careless cutting of branches it can be very effectively covered with *Thunbergia Grandiflora,* thus converting it into an attractive garden ornament.

The principal flowering season is winter although it flowers intermittently almost throughout the year. Propagation is by layering, cuttings and seeds. A rich fibrous loamy soil and a sunny location are best. Copious watering is essential.

Quisqualis Indica (Combretaceae)

This plant is very suitable for covering high walls effectively with a luxuriant screen of greenery mixed judiciously with red and white. Popularly known as the "Rangoon Creeper", this evergreen climber, ideally suited to the plains only, bears crops of flowers throughout the hot months and the rains in succession and intermittently throughout the year. The flower buds are colourless, the flowers are white initially but change to scarlet red later on. The flowers are sweetly fragrant in the evenings. The plant climbs up with the help of curved spines.

Occasional thinning and pruning, after the flowering is over, are-necessary to keep the climber within desired limits. Borne in drooping tussels, the blooms look majestic. Propagation is by layering and cuttings during rains. A light soil and a semi-shady-to-sunny location are good.

Ipomea Palmata (Convolvulaceae)

This plant is easiest to cultivate and the quickest to grow. 25-cms long cuttings are planted at the inception of the rainy season, in a soil consisting of loam, well rotted manure and leaf manure. *Palmata* will sprout readily and produce a metre high screen in about a month. A more lasting and a more attractive climber can be planted side by side so as to replace *Ipomea Palmata* in course of time.

Ipomea Palmata is also known as the "Railway Creeper". Its blue flowers are borne almost throughout the year in great profusion in clusters. Together with the foliage, it forms an evergreen screen giving a particularly refreshing appearance. The flowers open in the morning. Propagation is by cuttings during any part of the year. It does extremely well in sub-tropical and tropical areas.

Ipomea Versicolor (Convolvulaceae)

Popularly known as "Mina lobata", this plant is ideal for training over a trellis work. Its flowers are borne profusely. The colour of the flowers varies from crimson red, orange and yellow to white. They bloom in the hot weather and keep fresh for several days in fresh water. Propagation is by seed.

Clitoria Ternates (Leguminosae)

(Syn : Ternatea vulgaris, Family Leguminosae)

Commonly known as the "Koel", this plant is a pretty evergreen twiner climbing to a height of about five metres. The vegetative growth is luxuriant. Like the "Rangoon Creeper", *Clitoria ternatea* requires care to keep it in order. The leaflets are beautiful, small and oval and the showy blue flowers are borne in great profusion principally in July in the Indian plains, but intermittently almost throughout the year. The flower is borne in the axil between leaf and stem. There are varieties with single or double flowers of deep indigo blue colour or pure white. The white form is known as *alba*. Its fruit is a pod and propagation is by seed sown in February. Although a perennial, the plant is generally known as an annual climber in gardens. A semi-shady-to-sunny location and a light loamy soil are good.

Clerodendrum Splendens (Verbenaceae)

The buds of *Clerodendrum Splendens* start opening by the second week of January, clothing the climber with a cloak of brilliant red. This lasts up to the middle of February-March. A special feature of this climber is that it bears bunches of brilliantly coloured flowers, right from the base up to the top. The flowers produce an excellent colour contrast to the broad green leaves and to the buff, yellow or white background provided by the wall along which it is trained.

The climber is neat, evergreen with dark green foliage which is borne in an opposite manner. It can go up to five metres or so. The leaves are about 7.5-cm to 12.5-cm long and are broadly ovate to oblong-cordate and pointed. When spread along the wall, with a central stem and scaffolds spaced 22.5-cm to 25-cm apart, an impressive and gorgeous effect is produced.

By spacing closer the individual plants, an excellent evergreen screen can be obtained in a couple of years. The climber can be grown in a half-cut asphalt drum placed in the verandah from where it will climb pillars.

This climber is an ideal choice for a shady or semi-shady location. It is increased by layering during the rainy season.

No pruning is required except for the removal of diseased or dry wood and the occasional and annual light thinning, to keep it in tidy form. In the garden, a climber can be trained along the gate so as to cover it nicely. Syringing over the foliage is necessary in order to wash off dirt and dust which is fatal to the life of the plant.

Beaumontia Grandiflora (Apocynaceae)

Blooming to grandeur from January to March, this climber bears a magnificent crop of lily-like trumpet shaped white flowers. It reaches a height of seven to eight metres or more within three to four years. It is delightful to look at with its 20-cm to 22.5-cm long dark green foliage forming an excellent setting on a wall or the support provided for the purpose. The flowers possess a mild fragrance which is pleasing. A sunny and semi-shady location is suitable. The climber attaches itself to the support with the help of its strong tendrils. Propagation is by seed, cuttings or layering.

Pyrostegia Venusta Bignoniaceae
(Pyrostegia Venusta Bignollia Venusta)

Known as the "Golden Shower", this plant is an evergreen climber which is in its prime of beauty in the tropical areas in the cold weather. It is of medium growth, climbing with the help of tendrils and bearing clusters of brilliantly coloured orange flowers. It bears flowers so profusely as to form a shining sheet of colour with the foliage hardly visible.

Pyrostegia Venusta relishes an open and sunny location and a fibrous, moist, loamy and well-drained soil. A soil susceptible to water logging should be avoided as such a soil proves fatal to the life of the plant. The climber is easy to propagate by layering during the rainy season.

Trachelospermum Jasminoides (Rhynchospermum jasminoides Apocynaceae)

This climber is popularly known as the "Star Jasmine", or the "Malayan, African or Confederate Jasmine". It is an evergreen plant which becomes laden with tiny, five-lobed white flowers which are borne in great profusion in auxiliary and terminal racemes. It attains a height of six metres or more. The leaves are dark green, short-stalked, oval-lanceolate, smooth and are borne in an opposite manner.

The climber blooms from February to April-May in the Delhi climate. A sunny situation suits it best although it will flourish in semi-shady-to-shady locations as well. Propagation is by cuttings and layering during the rainy season. In the variety *variegatum,* the foliage is white and green, sometimes with a tinge of red but generally looking silvery variegated.

Passiflora (Passifloraceae)

Many a *Passiflora* specie is in the prime of its beauty during the summer months. It climbs up with the help of tendrils. *Passiflora Cacrulea* is a very common yet very beautiful climber. The flowers are large. The calyx and corolla are pale greenish white. The corona is a mixture of three shades, bluish at the top, white in the middle region and purplish at bottom. The flowers of *Passiflora antioquiensis* are rich rose-red. This specie is found blooming to grandeur in the hills of South India during the months of April and May.

Passiflora racemosa and *Passiflora leschenaultii* bear scarlet and white flowers respectively. The leaves are of two types. Either they are lanceolate or three-lobed and each lobe, in that case, is lanceolate, toothed and slenderly pointed. In *Passiflora edulis,* the flowers are white inside and greenish outside. The corona has filaments which are white with purplish band.

Compsis chinensis Tecoma Grandiflora (Bignoniaceae)

This plant is also known as the "Chinese Trumpet Creeper". Besides very attractive foliage, this climber which grows to a height varying from six-to-ten metres, bears bell-like, flame-orange and red flowers in pendulous and six-to-twelve flowered panicles. The flowers grow in great profusion during the hot weather. The corolla of the blossom is tubular in the lower region and very broad in the upper region, thus looking very impressive.

Compsis chinensis climbs with the help of aerial roots. The imparipinnate leaves are from 1.8-cm to 2.5-cm in extent. With both margins serrated, dark green on one side and light on the other, they are picturesque. The plant is a deciduous climber which sheds its leaves during winter. It should then be cut down to 45-cm to 60-cm from the ground and rich soil should be applied to the roots. The suckers that arise during the rains should be separated to get young plants before pruning the main climber. Propagation is by seed during March and from suckers during the rains. The seed is ripe for collection in November.

Adeno-calymma calycina (Bignoniaceae)

It is a plant climbing up to a height of about three metres with the help of its rather heavy tendrils. It blooms profusely in flushes from March to November producing trumpet shaped glistening yellow blooms. The leaves are trifoliate and evergreen, thus forming an excellent green screen and contrasting magnificently with the bright yellow flowers. *Adeno-calymma nitidum* also grows to the same height as *Adeno-calymma calycina*. Its velvety yellow flowers are borne in auxiliary and terminal racemes. In *Adeno-calymma allicea,* the flowers are of an exquisite mauve with a pinkish tinge. This plant is an evergreen climber.

The *Adeno-calymmas* mentioned above are all closely related to Bignonias and are natives of Brazil. They relish a sunny location, a compost of peat and loam and moist and warm conditions. They can be easily propagated by cuttings placed in sand.

Ficus repens (Moraceae)

For covering areas which remain constantly under shade as a result of overhanging branches, the "Indian Ivy", botanically known as *Ficus Repens* (*Ficus pumpila* of *Ficus stipulata*) is most effective. This plant clings to the surface of the soil with the help of its rootlets like ivy. The leaves are small and heart-shaped and are capable of forming a dense mantle of green. Its home is in China and Japan, and in India it is a native of Assam. It flourishes well in the plains in the shade. *Ficus repens* is a very hardy plant with a long life.

An interesting thing about *Ficus repens* is that it fruits occasionally and the flowering branches are different. The leaves on these branches are bigger and are elliptic oblong, narrowed at the base and with much larger stalks. These branches do not fall flat but stand out from the support. The fruit when formed is of the size of an edible fig.

Soil with the presence of lime in it is beneficial. Propagation is by cuttings.

Climbing Rose

The "Climbing Rose" is unsurpassed in beauty during spring. The flowers are available in pleasing shades of red, white and yellow. It is an excellent choice for training along the walls and along the windows. Through the window, one can inhale the sweet fragrance of the flowers and enjoy the beauty of its bloom.

Support should be provided by trellis work or by putting nails at suitable points on the wall in order to enable the growing shoots to climb up and spread methodically along the site. Once it takes root, the plant flowers profusely for a number of years. A shady situation has to be avoided under all circumstances.

The impressive yellow variety is often seen. This plant is known as "Marechal Niel" and belongs to the *Noisette* group of roses which possess a pendulous very weak flower stalk with flowers borne in drooping fashion. The flowers are liable to break at the junction of the stalk with the stem. These are borne in clusters, botanically known as *corymbs*.

Its fragrance is very pleasing and flowers can be arranged in shallow but elongated bowls. The yellow flowers arranged in a light green bowl on a dark brown or blackish brown table top make an artistic flower arrangement scheme. Women love to adorn their hair buns and locks with a very compact flower or two.

The plant is evergreen and during the summer months its greenery and shade impart coolness to the environment. Never prune this climber beyond the removal of dead, dry and diseased wood. The new leaves are *terra cotta* in colour, but later change to lemon green and finally to deeper shades. For training along arches and gates at entrances to the garden, this rose climber is a good choice.

Antigonoll leptopus (Polygonaceae)

It is popularly known as the "Sandwich Island Creeper" and "Coral Vine", *Antigonon leptopus* is distinctive for its attractive foliage with profuse sprays of tiny bright pink flowers. There are also white, pale, pink and carmine varieties. The leaves are borne alternately with a tendril opposite each leaf.

Allamandacathartica (Apocynaceae)

This plant is in full glory in Hyderabad gardens during the summer and rainy reason. Flushes of flowers are however produced three or times in the later part of the year also. The flowers are of a bright yellow colour shining beautifully in sunlight. It is a very easily grown climber, propagated by cuttings and layers. It is also an excellent choice for covering screens or eclipsing the nudity of bare spots from view in a sunny location.

VII
Flowering Shrubs for Spring and Other Seasons

Buddleia Madagascariensis (Loganiaceae)

Buddleia madagascariensis blooms from January to February producing in profusion bright pale orange-yellow flowers, rich in fragrance. As a potgrown plant also, it is effective. The shrub is tall but can be kept low by trimming and made to bloom at that level. Propagation is usually by cuttings during spring and rains. A sunny location is good.

Cassia Artemisioides (Leguminosae)

The bushes of *Cassia artemisioides* burst into yellow in early spring. This lasts for a month or so. Growing to a height varying from two metres to three metres, the shrub is grey all over and looks majestic when in bloom. It can withstand drought. A sunny location is good.

Coffea Bengalensis (Rubiaceae)

Coffea Bengalensis, popularly known as "Bengal Coffea" is a very dainty-looking ornamental flowering shrub when in full bloom during spring in the plains of North India and from March to June in the gardens of Bengal. The leaves which are pretty are shed during autumn and reappear after the snow-white flowers are produced on leafless branches at the inception of spring. It is a small Indian shrub attaining a height of a metre to a metre and a half. It relishes a semi-shady to sunny location and a moist sandy loam. Propagation is by seed and ripe-wood cuttings.

Spiraea Corymbosa (Rosaceae)

Spiraea Corymbosa is an exquisite flowering shrub with leafless pendulous branches which get studded with beautiful snow-white flowers. The leaves which appear afterwards are very elegant and dark green with margins serrated. During autumn, the leaves depict admirable glowing tints. Later, thinning and pruning can be done so as to train the bush into any desired shape. The removed wood can be used for making soft and hardwood cuttings for propagation purposes. The plant is an excellent selection for producing a mass effect. It proves indispensable for purposes of accent in group planting of shrubs in a shrubbery, rock pockets or in artistically-designed receptacles.

Streptosolen jamesonii (Solanaceae)

The pendulous branches of this plant popularly known as "Fire Bush", prolifically bear bright orange-red flowers during the spring in regions of medium to high elevations. This large-scale flowering gives the shrub a grandeur, besides adding to the colour of the garden. The shrub is successfully grown in plains, too. It is evergreen, bearing two and a half to five cms. long pretty foliage tapering at both ends. Propagation is by softwood cuttings. It grows to a height varying from one to two metres and is capable of climbing the supports, thus also serving the purpose of an excellent climbing shrub.

Streptosolen jamesonii is a good choice for a shrubbery, for mixed border and for avenue plantation, when grown in the form of a standard.

Calceolaria integrifolia

Popularly known as the "Pouch Flower", *Calceolaria integrifolia* is a delightful shrubby perennial which is in the prime of its beauty in the spring season, in the plains of North India.

The yellow mass of tiny, 1.25-cm blossoms is in tune with the yellow colour associated with Basant Panchami. *Calceolaria integrifolia* relishes a cool atmosphere. Propagation is easy from cuttings. It grows to a height varying from a metre to two metres. Bushy in habit, with stems hairy and foliage oval, lanceolate and toothed artistically, *Calceolaria integrifolia* grows into a 45 to 60-cms high alluring plant in a 22.5 to 30-cm-sized earthern pot.

The variety *Calceolaria amplexicaulis* grows 30-cms to 60-cms high. The foliage is cordate-ovate to ovate-lanceolate. The flowers of a pleasing pale yellow, slipper-hoof-shaped are borne on upright corymbs.

Camellias (Theaceae)

Camellias are the glory of a spring garden in the hills, producing single or double flowers in many attractive colours. Red and white are the most popular shades. In Ootacamund and Coonoor, they bloom in the cold weather and spring. A well-drained soil tending towards acidity and a slightly-humid atmosphere provide the ideal condition of growth for this shrub. *Camellias* are propagated by seed cuttings, layering and inarching.

Camellias reticulata, five to six metres in height, bears deep-rose flowers. In *Camellias Japonica*, which is popularly known as the "Japanese Rose", the type bearing double-red flowers is very popular.

Russelia juncea (Scorphulariaceae)

Weeping Mary puts forth coral-red blossoms profusely in spring and summer thus making itself one of the prettiest garden ornaments. Attaining a height of 90-cms or more, the shrub is evergreen with ornamental foliage. It relishes a rich soil and an open and a sunny location.

Sambucus nigra (Caprifolfiaceae)

Flowering in early summer in the Delhi climate and almost throughout the whole year in a climate like that of Calcutta, *Sambucus nigra* is a large shrub. It is also popularly known as "Elder" in England, "European Elder" in America and "Elderberry" in India.

A sunny location and a rich, moist, loamy soil suit it best. Propagation is by planting the leafless cuttings in the open, during autumn, or tender cuttings in the rainy season.

Sambucus nigra attains a height of more than three metres and often assumes the shape of a 10-metre tall shrubby tree. The foliage is highly ornamental with five to seven leaflets and with beautifully toothed margins. The flowers are white and fragrant. *Sambucus nigra* is very effective for mass plantation in schemes of formal and informal gardening. In hills, it blossoms in summer.

Gardenia jasminoides (Rubiaceae)

Gardenia jasminoides Gardenia florida variety *fortuniana* is a low shrub. It blooms during April and May in a climate like that of Delhi. The leaves are leathery and evergreen and the flowers are semi-double to fully double, snow-white and highly fragrant. An open and sunny location and sandy loam are good. Propagation is by cuttings. It can be grown in the front line of a shrubbery, in rock pockets and as a decorative flowering pot plant in a 30-cm receptacle.

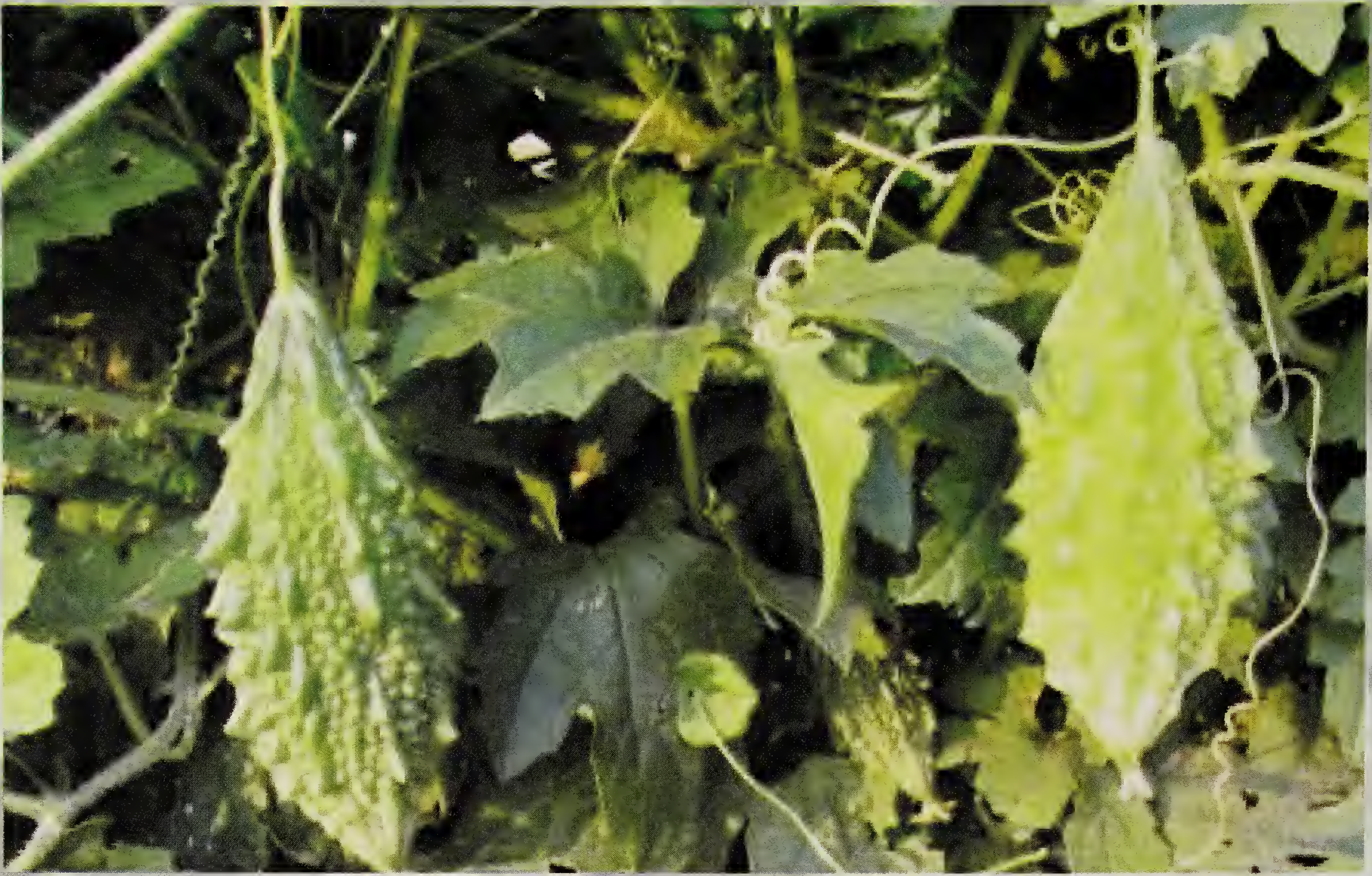
Brugmansia suaveolens (Solanaceae)

Popularly known as "Angel's Trumpet", *Brugmansia suaveolens* is in its prime of beauty in the hot weather. It produces white and fragrant flowers with expanded corolla, in great profusion. It is a spreading type of shrub which attains a height of three metres to five metres.

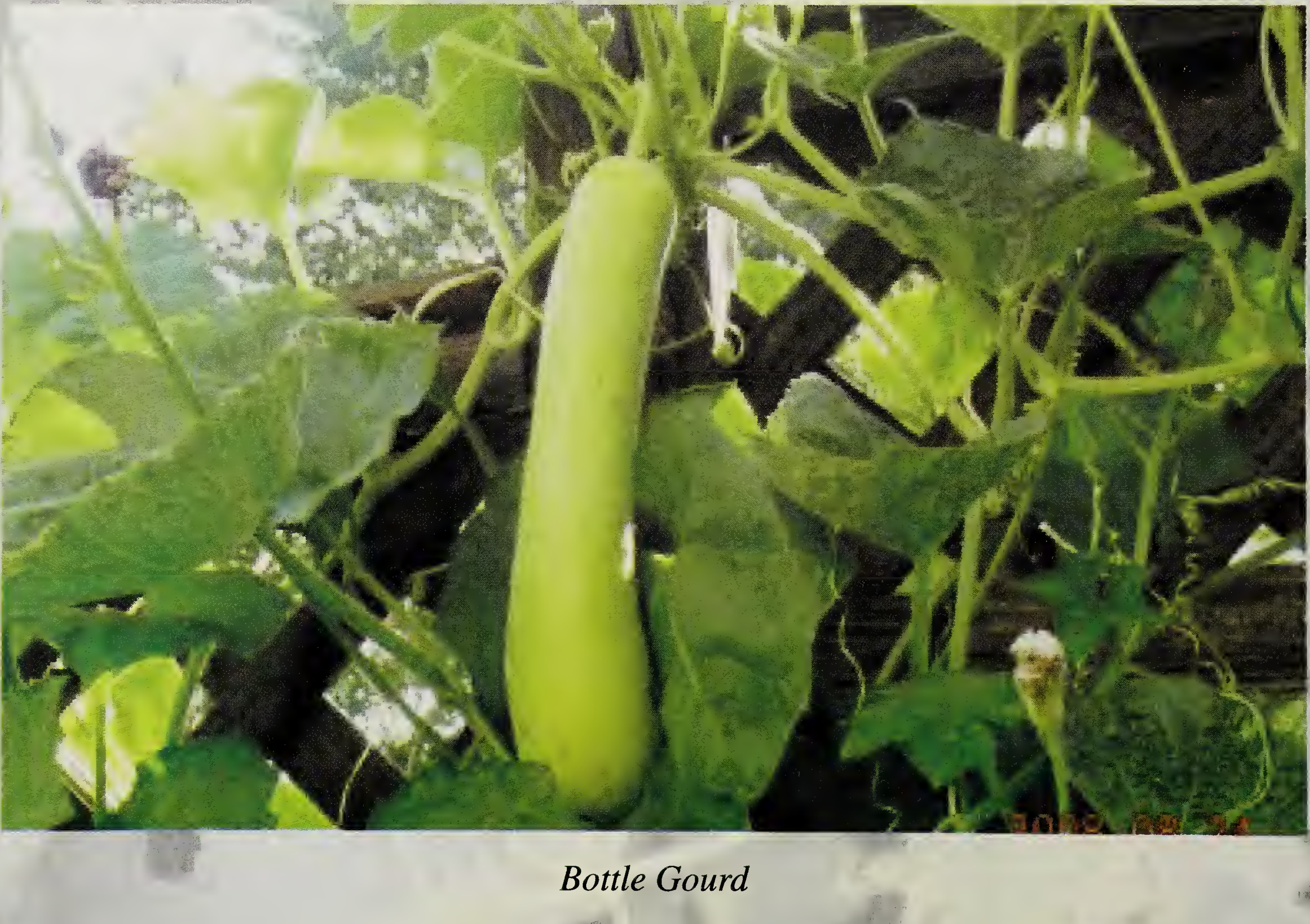
It requires pruning. This is done immediately after flowering, so as to maintain the shrub in a compact form. The application of liquid manure during the flowering period is beneficial.

The leaves are 15 to 30-cms long, with margins devoid of any serrations. The flowers are single or double, 22.5-cms. to 30-cms. long and pendulous. This

Soft Gourd



Bitter Gourd (Karela)

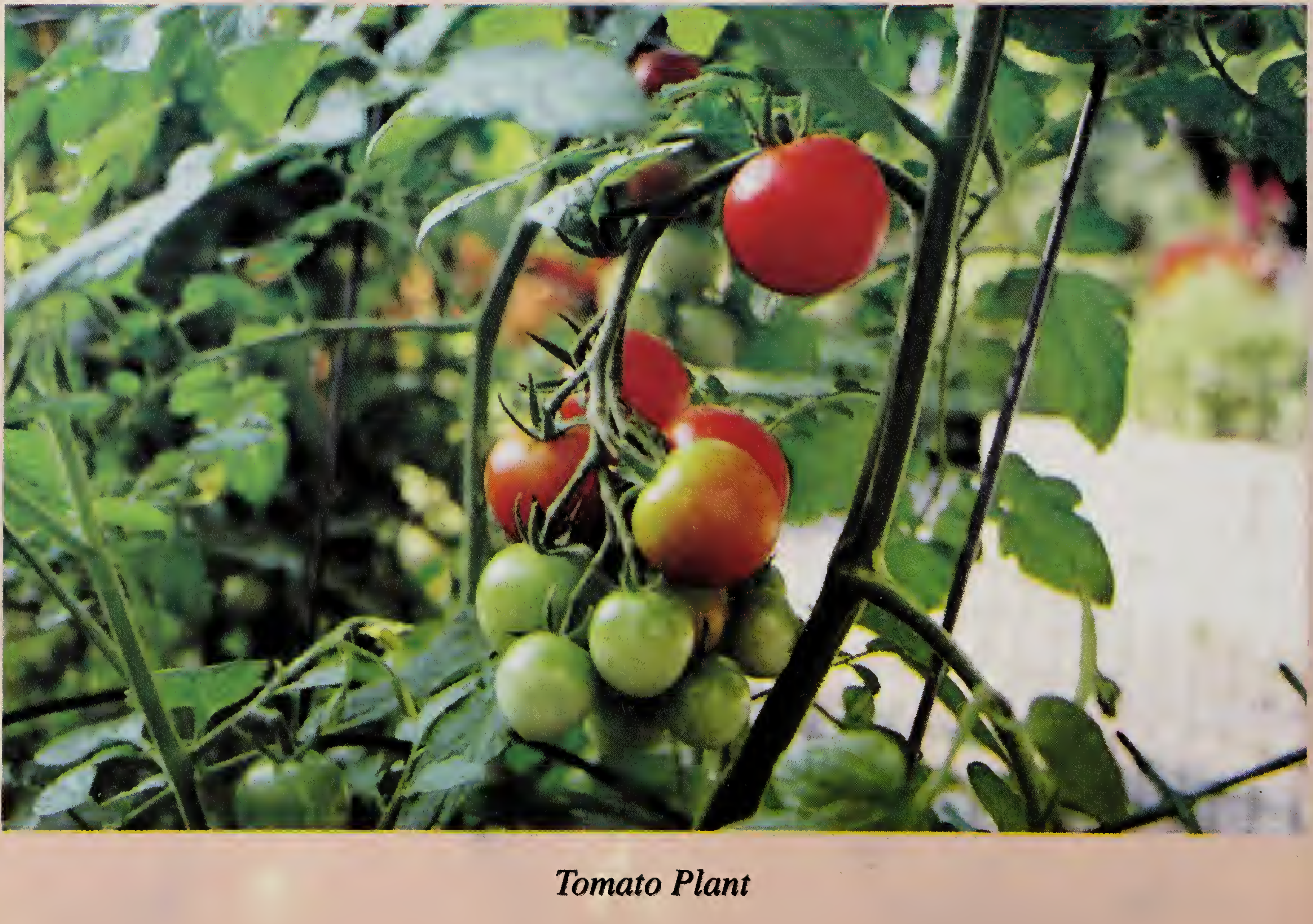


Bottle Gourd

Sweet Corn

Sweet Corn Plant

Tomatoes



Tomato Plant

shrub will look most effective when planted in clumps in a shrubbery or in an isolated manner, in schemes of informal gardening or in big rock pockets.

Jacobinia coccinea (Acanthaceae)

Jacobinia coccinea is a pretty foliaged evergreen shrub which produces a lovely crop of vermillion-red flowers during summer for several weeks. It will grow successfully and produce flowers under the shade of a clump of trees. Cuttings of a length of 12.5-cms to 15-cms can be planted during rains in order to obtain bushes for plantation at site by the next season. In a rock garden, the planting of *Jacobinia coccinea* will look very effective. The flowering branches which are arching, are very fascinating to the eye. By training methodically, slopy areas or mounds can be covered effectively with its branches. As a pot plant also it is highly decorative.

Punica granatum (Punicaceae)

Punica granatum popularly known as "Gul-i-Anar", starts flowering towards the end of March in the plains of North India. There are single and double varieties available and the blooms are most showy in glowing shades of deep vermillion-orange. The shrub is a deciduous one, shedding the leaves in winter but looking elegant with its luxuriant green foliage during spring. The shrub grows to a height of two metres or more.

Hibiscus hamabo (Malnaceae)

A magnificent species of *Hibiscus* which is in full bloom in the summer months in Delhi is *Hibiscus Hamabo* which has been introduced from Japan. The foliage is pretty, whitish and woolly-underneath and greyish-green above.

Hibiscus Hamabo grows to a height varying from 2.25 to three metres or more and produces large, brilliantly yellow-coloured and cup-shaped flowers. The flowers have a deeper tinge at the base and are velvety maroon in the region where the petals meet one another at the base. The staminal tube protruding is more than 3.75-cms long, the top 6.25-mms. region being a very deep velvety maroon. The petals of the flowers are yellow and possess very prominent canary yellow veins on the outer surface.

Magnolia coco Magnolia pumila (Magnoliaceae)

Among *Magnolias* which are famous for their delicate flowers, rich in sweet smell, the species *Magnolia coco* (syn *Magnolia Pumila*) is in ideal shrub for semi-shady situations at lower elevations. It attains a height varying from 60 cms to 120 cms. The plant is evergreen and produces,' during summer months, white flowers in a drooping fashion. Their sweet fragrance is scented from afar. As a pot grown plant, *Magnolia coco* looks very attractive. It is easy to grow it from seeds and by layering.

Jasminum sambac

Popularly known as "Motia" in North India, "Bela" in South India and "Bel-Bela" in Calcutta, *Jasminum sambac* is the glory of a summer garden from April to June. A year-old bush yields blooms. The refreshing green foliage is soothing to the eye and the single, semi-double or double, fragrant and white blooms clothe the bush in a sheet of white.

Jasminum sambac looks best in an open and sunny location. It grows 90 cms. to 1.5 metres high. After flowering is over the bush may be headed back to a height of 30 cms. to 45 cms from the ground level. The wood pruned can be utilised for making 10-15 cm long cuttings for propagation. The cut flowers are excellent for flower arrangement.

Cestrum purpureum (Solanaceae)

Tall in stature, graceful and rambling in habit, *Cestrum purpureum,* a native of Mexico, produces in summer reddish-purple flowers in dense, pendulous terminal-panicles. The branches are a metre to a metre and a half long. There are no flowers on the plant in the month of December. The shrub however maintains its evergreen character by retaining its foliage. A peculiar behaviour of this shrub has been observed in the Delhi climate. Here, on opening, in March, the flowers are a yellowish, but turn reddish later; in the rains they remain yellow and in winter turn reddish-purple.

Cuttings, 15 cm to 22.5 cm long, can be planted during the rains at site or in nursery beds. In the latter case, they can be transplanted after they have taken root. The ideal season for this operation is the rainy season.

Turnera Ulmifolia (Turneraceae)

Turnera-ulmifolia, known also by such names as "West Indian Holly" and "Sage Rose", attains a height of 60 cms to 120 cms. The leaves, green above and whitish beneath, are oblong in shape, They are hairy on both surfaces.

Turnera ulmifolia is in its prime of beauty in the plains of North India in summer. It is a popular sub-shrub of Calcutta gardens. The flowers are large, bright yellow, almost devoid of stalk and look very beautiful. The variety *elegans*, formerly known as *Turnera trioniflora*, a native of Brazil, is more dwarfish than the type growing 30 cms. to 60 cms high. The flowers are of a soothing pale or sulphur-yellow colour, with the heart region of a fascinating purple brown or maroon colour.

A light loamy oil is good. Propagation is by seed cuttings and division.

Nandina domestica (Berberidaceae)

Nandina domestica is an excellant introduction from Japan to hill gardens although it has been acclimatised to the plains, too. This shrub is majestic with pretty foliage turning reddish during winter and autumn and with lovely long panicles of brilliant white during the months of May, June and July. Its popular name is "Sacred Bamboo of China". *Nandina domestica* looks grand even without flowers because of its beautiful leaves.

Nandina domestica is evergreen and grows to a height varying from two to three metres. Grown from seeds and cuttings, it does well in a rich moist soil and is capable of standing frost well. In tropical areas with high humidity, it rarely flowers though vegetative growth is luxurious.

Paeonias (Ranunculaceae)

Paeonias are the gay bloomers of summer in the hilly regions, producing very impressive large-sized blooms in hues of purple, red and white.

A well-drained rich heavy soil is good. *Paeonias* relish a slight alkalinity but cannot tolerate acidity. Propagation is by seed, division and grafting.

Paeonias sunguluosa, growing to about two metres, puts forth rose-pink to white flowers, fully double in size. In *Paeonias potanim*, which is 1 to 1.5 metres tall, the blossoms are of a bewitching maroon colour.

Magnolia soulangeana (Magnoliaceae)

Magnolia soulangeana is an exquisite shrub, with bicolour flavors exuding a delightful aroma. It blooms from April to June in the hills. In the month of April when the shrub is leafless, it is covered with flowers all over. Each bloom is white inside and purplish outside. By June, new leaves are produced which become dark green on attaining maturity. It grows to a height of two and a half to three metres or more. A semi-shady spot is ideal for planting it.

Rhododendrons (Ericaceae)

Rhododendrons grow to perfection in the hilly tracts of India where they produce from April to June a crop of lovely bell or funnel-shaped blooms in several shades. *Azapeas* are included in this group. Easily grown from seeds and by layering and grafting, *Rhododendrons* grow tall or remain dwarf. There are evergreen and deciduous species.

The ideal soil for *Rhododendrons* is a well-drained sandy loam, 60 cms to 75 cms deep, with the addition of a fair quantity of peat to it. The soil should always be kept moist. A semi-shady location is ideal, exposure to full sunshine also not being beneficial.

In *Rhododendron indicum* syn *Azapea indica* which are one to two metres high, the flowers are available, among others, in scarlet red, pink and purple. In *Rhododendron weyrichii,* three to three metres and a half tall, the blooms are funnel-shaped and brick-red. *Rhododendron kaenpfro*, growing to a height of three metres or more, produces orange-red to pink flowers.

Spiraeas

Among *Spiraeas, Spiraeas thumbergii* and *Spiraeas prunifolia* are the prolific bearers of lovely blooms in a summer in the hilly tracts of India. *Spiraeas thumberii* is laden with bunches of wreath-like white flowers thus making itself an exquisite garden ornament. The shrub grows to a height of about 1.25 metres. In order to get excellent flowers every year, pruning of the shrub after flowering is necessary.

Spiraeas prunifolia, which grows two metre-high, gives double flowers of a shining white. The leaves of this shrub turn red during autumn.

Syringa persica (Oleaceae)

Blooms of *Syringa persica*, famous as the "Persian Lilac", are fascinating because of their lilac colour and sweet smell. Hardly a flower garden in the hill fails to have this shrub. It is superb for producing a mass effect in a shrubbery. Planting in clumps or in a line is necessary for giving the mass colour effect. It is also a summer bloomer in the hilly regions of India.

Growing to a height of about two metres, it is propagated by cuttings of half-ripened wood and by layering. A sandy loam, which has to be enriched with manure and fertilizers and kept towards the moist side, is ideal for *Syringa persica.*

Viburnum opulus (Caprifoliaceae)

Viburnum opulus, popularly known as "European Cranberry Bush", is also an excellent summer bloomer of the hills, producing white flowers in clusters. The shrub grows to a height of three metres or more. It can be easily increased by half-ripe wood cuttings and through seeds. A sunny location and a fertile soil are essential.

Flowering Shrubs for Rains

Jasminum sambac flore-pleno (Oleaceae)

With the onset of rains, "Mogra", botanically known as *Jasminum sambac flore-pleno*, throws out in abundance, on upright, brittle and evergreen branches, fully-double, white and fragrant blossoms. The flowering continues for a couple of months and the leaves remain evergreen throughout the year. Cut flowers with long stalks are superb for flower arrangement and flowers, stripped of stalks, are used by women for ornamenting their hair-locks and for buns.

Attaining a height of a metre of a more, "Morga" is superb while in full bloom. After the flowering is over, watering should be reduced to once in three weeks till the end of January, when the bush should be headed back and manuring be done. After that, watering should be copious in order to secure a prolific flowering crop. A sunny location is best.

Mussaenda frondosa (Rubiaceae)

White Sepallad Mussaenda : A characteristic feature of *Mussaendas* is that one of the sepals, which is much longer than the other, is coloured. This forms the most conspicuous ornamental part of the flower and contrasts magnificently with the green foliage.

Mussaenda frondosa : Blooming from July to October, this plant bears yellow flowers. The odd sepal is white. It attains a height of about one metre and relishes open and semi-shady-to-sunny locations. Soil consisting of peat, leaf mould and loam, in equal parts, with sand added, suits it best. Plants can be increased from cuttings of soft and half-ripened wood, during the rainy season. Propagation is by seed as well. *Mussaenda frondosa* is ideal for planting in clumps and as a decorative pot plant.

Artabotrys odoratissimus (Annonaceae)

Artabotrys odoratissimus, known as "Hari Champa" produces curiously shaped and highly fragrant flowers from the beginning of the rainy season to November. The flowers are greenish at first but turn yellowish on maturity and exude the sweet smell of a slightly over-ripe apple. It is one of the most majestic evergreen shrubs, growing to a height of two to three metres. The foliage is pretty. Its fruit turn golden on ripening. The shrub then looks highly ornamental. Its berries can also be used effectively in schemes of interior decoration. A single flower placed in a bowl of water and kept in the drawing room will spread its fragrance to the remotest corner of the room.

"Hari Champa" propagates itself by seed and through suckers. The latter can be lifted during early February and planted at the required sites. A sunny location in the hills and a semi-shady location in the plains is desirable. As a tall screen with evergreen foliage, for hiding some unsightly object in the garden, nothing is more effective than *Artabotrys odoratissimus*.

Pootia grandiflora

Bearing during hot weather and the rains, creamy flowers so twisted as to form a salver pattern, *Pootia grandiflora* looks magnificant. The flowers exude a mild fragrance throughout the rainy season. For the shrubbery or the clumps in a scheme of informal gardening, it is an ideal choice.

Propagation is from cuttings during the rainy season. The shrub grows one and a half to two metres tall in the plains of North India and up to three metres in the plains of Eastern India. Ordinary soil and a semi-shady-to-sunny location is needed.

Bauhinia sulphilrea (Leguminosae)

Bauhinia sulphurea looks majestic with its yellow, large blossoms of a pale yellow colour borne profusely from August to September in the plains of North India during hot weather and in the rainy season in a climate like that of Calcutta. Tall in stature, it attains a height of two to three metres. The evergreen foliage keeps the shrub elegant almost throughout the year.

Pod formation starts in the month of September. Seeds may be collected from the middle of November to the first week of December before the fruits burst and release the seeds they contain. Grown in a big-sized receptacle, it looks highly ornamental.

Citharexylon fruiticosum (Verbenaceae)

Citharexylon fruiticosum, a deciduous shrub, attaining a height of a metre to a metre and a half, is gorgeous in any sunny location. Orange-stalked leaves produce a delightful contrast with their green colour. Later, during autumn, the foliage turns reddish producing alluring autumnal tints. The highly-fragrant flowers in a shade of white are borne profusely on 15-cm long drooping racemes or spikelets, in the rainy season. The fruit is red, later turning black. The branches are four-angled and the bush can easily be increased by cuttings during spring or the rains. As a pot-grown plant, *Citharexylon fruiticosum* looks highly decorative. Flowers can be used in adorning vases for interior decoration.

Abelia grandiflora (Caprifoliaceae)

Attaining a height of about two metres, *Abelia grandiflora* grows into a bushy shrub to which its bronzy green and glossy leaves lend great beauty. The flowers are small and bell-shaped and are white and fragrant. When the flower petals fall, the sepals, which are of a pleasing brownish or purplish colour, remain on the branch and impart a highly ornamental look.

A well-drained rich, loamy, soil to which has been added plenty of leaf mould is ideal for *Abelia*. A semi-shady situation easily accessible to a free passage of air is good in regions of extreme heat whereas, in the humid areas, it can be grown very successfully in a sunny location. Propagation is by green-wood cuttings, during the rainy season. Cuttings of ripened wood are also used for increasing the shrub. The blooming season in the plains of North India extends from August to October. In Bangalore, it blooms in summer and flourishes in a sheltered position.

Lagerstroemia indica (Lythraceae)

Lagerstroemia indica, popularly known as "Gul-i-Phanoos" and' "Crape Myrtle", starts blooming scantily in summer and profusely ill the rainy season. The shrub is very useful in the summer and the rains for a variety of situations. It could be planted in the form of an avenue in a garden; in clumps, in schemes of informal gardening; on slopes and mounds in rock pockets, or as individual specimens on lawns, either in individual colours or in mixed shades.

By methodical and judicious training, the shrub can be kept as low as 60 cms and made to bloom at that height. This treatment is absolutely necessary when *lagerstroemias* are planted on slopes or in rock pockets, with a view to obtaining a natural effect. *A lagerstroemia indica* bush, if allowed to grow unchecked, will attain a height varying from five to six metres. White, pink and mauve are the popular colours met with in this species.

Since by clipping and trimming, the plants kept at lower heights flower well, people devoid of garden land can grow them in mosaic enclosures or other suitable receptacles. A sunny location and a sandy loam are good. It is easy to plant 25 cms to 30 cms long cuttings, in spring or during the rainy season, so as to get plants at a very low cost.

The shrub is deciduous. It sheds its leaves during autumn but awakens to life again at the commencement of spring. During the leaf-fall period, winter season annuals can be grown around. The annuals will complete their life cycle by spring and thus, by this process, the elegance of the site can be maintained throughout the year.

Flowering Shrubs for Winter

Hamiltonia suaveolens (Rubiaceae)

Hamiltonia suaveolens is at its best from November to February when it bears highly-fragrant white flowers. A sunny location and loamy soil are good. Propagation is by cuttings of half-ripened wood and the proper time for this is February or the rainy season. The shrub attains a height of about two metres. It is suitable for planting in clumps or as a shrubbery in a garden. If a potted plant is placed in a sunny location in a balcony or on the porch, it will fill the surrounding area with the sweet fragrance of its flowers.

Woodfordia floribunda (Lythraceae)

Clad in a sheet of red this plant makes itself a pretty garden ornament. This shrub is of the weeping type and the flowers, borne profusely on drooping branches, look very impressive. A sunny location is desirable. The foliage turns red during autumn, adding thereby great charm to the shrubbery. *Woodfordia floribunda* attains a height varying from a metre to three metres.

Dombeya aliporensis (Steraculiaceae)

Dombeya aliporensis, a majestic evergreen shrub, starts throwing out bunches of pinkish flowers in abundance from the first week onwards of December in the plains and continues blooming for about three months. The leaves are pretty and the flowers, borne on upright and arching branches, are highly impressive. Cut flowers, when used in vases in schemes of interior decoration, look magnificant.

Flowering is over by the middle of March when the shrub should be headed back to a height varying from a metre to a metre and half. Cut branches could be used for the preparation of 22.5 cms. long cuttings. These should be planted about 15 cms. deep in a shady spot for propagation of new plants. It is a very quick-growing shrub attaining a height of over two metres in just two years.

Malvaviscus drummondii (Malvaceae)

Par excellent are the 3-4 cm long vermillion-red blooms, with the staminal columns producing out 1.25 cms. above the petals in *Malvaviscus drummondii*. The flowers are produced in abundance mainly during winter and spring and, thereafter, intermittently throughout the year. They look extremely charming especially because they contrast pleasantly with the foliage. The shrub attains a height of three metres or more. Essentially a sun-loving plant, it can grow successfully in semi-shade, too. Propagation is by seed and by cuttings as well, during the rainy season.

Shrubs Flowering Throughout the Year

Angelonia bieolor (Seorphulariaeeae)

An extremely charming sub-shrub producing tender branches studded with well-shaped tiny flowers *Angelonia bicolor* can find a place in the middle line of the shrubbery, in a clump in the rockery and in an artistically-shaped bowl or vase.

A sunny aspect, compost consisting of light loam, leaf manure and sand and protection from extreme cold and heat enables the plant to throw out prolifically erect, flowering spikes, more or less throughout the year in the plains. *Angelonia bicolor* can easily be increased by seed and soft wood cuttings during the rains. The flowering spikes are effective in schemes of interior decoration.

Cestrum diurnum (Solanaceae)

Cestrum diurnum, popular by the name of "Din-ka-Raja", in contrast to "Raat-ki-Rani", is in full majesty during day-time, producing three or four flushes of flowers in a year. The blooms are white and exude a deliciously sweet smell in day-time. The plant bears blue berries, after the flowering is over. The berries are highly ornamental. The flowers and the berries are used in schemes of flower arrangement. A sunny location is good. Propagation is by cuttings.

The plant is evergreen and ideal for growing in pots also. It grows to a height of one metre and a half to two metres.

Beloperone oblongata (Acanthaceae)

Beloperone oblongata, popularly known as the "Shrimp Plant", produces bi-lipped, rose-purple flowers surrounded by colourful bracts, in abundance in spring, and thereafter, intermittently throughout the year. It is evergreen and grows to a height varying from 30 cms. to 90 cms. Propagation is by seed and cuttings. Sandy loam and a sunny location are good.

Sophora tomentosa (Leguminosae)

Sophora tomentosa is a very quick-growing shrub with handsome foliage. It produces lovely, tiny, pea-shaped flowers of a bright yellow colour, almost throughout the year. *Sophora tomentosa*, though tall attaining a height two and a half to three metres, flowers well even in a 20-cm pot.

A well-drained soil, loamy in texture and kept towards the drier side, yields excellent results. *Sophora tomentosa* can easily be increased by seed, layering and cuttings taken from green-wood. Plants grown from seeds take about three years to come into the blooming age. It is a sun-loving plant.

Ochana squorrosa (Ochnaceae)

Attaining a height of two to three metres, *Ochana squarrosa*, popularly known as "Ramdhan Champa", can be grown from ripe wood-cuttings and from cuttings of half-ripened wood. Planted in a well-drained fibrous loam, the cuttings will take root and will be fit for transplanting during the succeeding rainy season. The leaves are leathery and toothed.

The flowers, which are of a brilliant yellow colour, are borne on the bush, almost throughout the year in Calcutta. In a climate like that of Delhi, the shrubs flower during summer and the rains. The blooms are lovely to look at. They keep up the grandeur of the bush for several weeks. The plant has also the characteristic of showering its delightful aroma all around.

Seedlings developed from seeds are slow to grow in the early stages but the plants shoot up thereafter.

Cuphea jorullensis (Lythraceae)

Cuphea jorullensis, famous by the name of "Cigar Flower", is a 30 cms to 45 cms high, much-branched and pretty-foliaged shrub. It looks very charming with its tubular, cigar-like white blooms, which are tinged yellow or orange at the 12-toothed apex and are scarlet at the base, the stamens and filaments being red, The flowering period extends from May to June and July to October in Calcutta. In the plains of North India in regions free from frost, flowers are produced in winter also.

The new growth of the stem region in the month of December in the Delhi climate is deep brownish-red in colour. It contrasts magnificently with the green leaves borne in an opposite manner. The bark of the mature wood is whitish.

Cuphea jorullensis attains, in some areas, a height varying from 60 cms to 90 cms. Propagation is by seed and cuttings. Any garden soil will do.

Serissa foetida S. Japonica (Sapindaceae)

Serissa japonica is more or less constantly in bloom in the plains of East India. The flowers are usually double white, the size being equal to the buttons of a shirt, although the species produces single blooms as well. There is a variety producing double red flowers. Another variety produces foliage, the margins of which are of a golden or yellow colour. In the variety *variegata* the leaves are dark green with ivory-white margins. The mid-rib portion is also of an ivory white colour and the flowers borne are, too, white.

A loamy soil with the presence of compost, peat and sand suits-*Serissa japonica.* Propagation is by cuttings, slips and root cuttings.

Brya ebenus

Popularly known as "Jamaica" or "Green Ebony" and "Cocus Wood", *Brya ebenus* grows tall, bearing tiny green foliage on weeping branches. The flowers are golden yellow, highly fragrant, and are produced in several flushes in a year. The shrub is a good choice for group plantings in the shrubbery.

VIII
Flowering Trees Round the Year

Trees Flowering in Spring

Prunus Domestica (Fam: Rosaceae)

BOTANICALLY KNOWN as Prunus Domestica, "Alucha", the "garden plum", is a graceful tree which can be trained into any artistic shape by trimming and thinning. It can fit in any scheme of formal or informal gardening. During spring, it is partially clothed in greenery, the remaining portion being covered with trussels of snow-white flowers at different angles. The tree attains a height of five to seven metres and forms a shady clump. The flowers are excellent for any scheme of interior decoration. The arching branches form pleasing angles. As a result of the odd shape of the branches the flowering shoots make admirable objects of wall decoration in a drawing room and in any scheme of Japanese-style flower arrangement.

It can be grown in a mosaic receptacle, trained into an artistic shape and kept at a suitable spot in the verandah or porch.

Easy to propagate from cuttings, a four-year-old tree produces a prolific crop of lovely flowers. Pruning should be done every year to preserve its vigour for a long time.

Tabebuia Rosea Bignoniaceae Tecoma Rosea

Popularly known as the "Rosy Trumpet Tree" this tree is a delight to see in early spring. It bursts into a shower of deep-flaring lilac-rose in the first week of February. The blooms stud the leafless branches most colourfully. The terminal panicles of large deep-rose coloured funnel-formed and campanulate blossoms are magnificent.

This beautiful scene dominates the landscape for at least over a month and a half. In the Delhi climate, the flowering starts from the middle of January and continues till the first week or middle of March. By the end of March, in a continental climate, the tree is well covered with digitately-arranged compound leaves. Each leaf has three to five-leaflets and each leaflet is 7.5 cm to 10 cm long and 2.5 cm to 5 cm wide, with the odd leaflet being the largest and unequal sided. The new leaves are of a lighter shade and the old ones are of a darker tone, thus producing a bicolour effect. The flowers open in the morning and fall at night. Planted as a road-side tree in India, it is deciduous. In the American climate, it is said to be evergreen. It is a common tree in Bombay, where it seeds freely.

Tabebuia which is a small-to-medium-sized tree, attains a height of seven to ten metres and is ideally suited for growing in tropical and sub-tropical regions. Its home is in Mexico, Central America and Columbia. It is usually propagated from seeds although it can be increased by cuttings and air layering also. A richly-manured soil is ideal.

Haematoxylon Campenchianum (Leguminosae)

Haematoxylon Campenchianum maintains its elegance almost the year round. In spring, it is laden with racemes of yellow flowers and beautiful bi-pinnate foliage. The tree is useful for creating artistic pendulous groves for relaxation. Of medium size, it grows to a height of 7 to 13 metres. The trunk is uneven, presenting an interesting composition.

Propagation is by cuttings which can be planted in sand. The tree has great commercial value because of the preparation of a dye-stuff from the heart-wood. The heart-wood turns red on exposure and is broken into small chips before use.

The landscape becomes ablaze with crimson red when flower buds of *Callistemon Lanceolatus*, commonly known as "Bottle Brush". (Farm : Myrtaceae) open out, in full bloom in spring. The tree has pretty foliage of refreshing green. The flowers hang down the branches in profusion during March and April. This tree is ideal for planting in small bungalow gardens. Easy to propagate from seed, it starts flowering in its fourth year in the plains of North India.

Bauhinias (Leguminosae)

Bauhinias are the glory of an ornamental garden from spring to Summer. These are small trees, having an height of five to seven metres and offer a variety of colour. The prominent colours among them are white and purple and variegated. The dainty flowers present a delightful scene. Easy to raise from seed, the plants are quick-growing. In about four years, they attain a height of two and a half to three metres and produce a satisfactory crop of flowers. As years pass, the tree attains a robust form and blooms in profusion at the beginning of spring.

Bauhinia Alba, producing white flowers in spring, is evergreen whereas *Bauhinia Variegata* bearing purple and variegated flowers is a deciduous one, shedding leaves during winter and introducing new leaves and flowers in spring.

Bombax Malabaricum (Bombacaceae)

Bearing scarlet flowers during spring on leafless branches, *Bombax Malabaticum* is also known as the "Cotton tree", "Silk Cotton Tree" or "Simbal". It is a quick-growing tree which attains a height of about 20 metres. The trunk studded with stout artistic prickles is straight, lending an imposing posture to a majestic deciduous tree. Silk cotton which is used in stuffing pillows, cushions etc. is obtained from the fruit. Propagation is by seed. A rich soil is beneficial.

Butea Frondosa—Leguminosae

Popularly known as "Dhak tree" or the "Flame of the Forest", *Butea Frondosa* is a very common tree in India. The black soil of East India and the saline soil of Punjab are ideal for this tree. It is a deciduous tree which is low and spreading, attaining a height of about seven metres. Flowers are orange-scarlet. Of great, economic value, the tree yield lac and its flowers yield an orange dye. Its juice, known as "Bengal Kino", taken from incisions in its bark, is used as an astringent.

Propagation is done by cuttings. The 'home' of *Butea Frondosa* is in East India and Burma. It is an ideal tree for wild situations and rocky areas.

Gliricidia maculata (Lonchocarpus Maculatus) Fam. : Leguminosae

Small in stature, is glorious in the flowering stages, from the middle of February to April. It bears elegant rose-coloured blooms and pendulous, feathery, green foliage. It is easy to grow from seed and also from a metre to metre-and-a-half-long cuttings. Introduced from Gautemala, it adorns the picturesque landscape of Port Blair, Nicobar and Andaman Islands. *Gliricidia Maculata* is mostly leafless during the-flowering period.

Summer Bloomers

Soothing azure-blue *Jacarandas*, majestic bright yellow *Amaltas*, exquisite tall brownish golden-yellow, *Silver Oaks* and gorgeous reddish-orange, *Gul Mohurs*, snow-white *Magnolia Grandiflora* yielding a sequence of blooms in summer in the plains of India, make the summer season colourful despite the depressing effect of extreme heat. Propagation of these trees is by seed which are sown in May. Germination takes place in about three weeks and the saplings are ready for transplantation during the rains. They may be planted at the required sites when a year old.

Jacaranda Mimosifolia-Fam. :—Bignoniaceae

Jacaranda Mimosifolia blooms in April when it is clad in a sheet of azure blue. It grows to a height of seven metres or more. A native of Brazil it has been very successfully introduced in Indian gardens. Ideal for planting in sub-tropical regions, the tree is deciduous only in early spring; the foliage is prettily cut so as to look fern-like and the flowers are produced on 20-cm-long panicles, each bearing 40 to 90 flowers.

An open and sunny location and a sandy or fibrous loamy soil, are desirable. For avenue plantations, the distance from tree to tree should be seven to ten metres. For woodland effect, saplings should be planted very close.

Gaevillea Robusta—Fam. :—Proteaceae

Grevillea Robusta, a sub-tropical plant, is an evergreen tall tree attaining a height of 13 metres and above. It is given the popular name of *Silver Oak* because of its foliage being silvery underneath and green above. It is in full bloom in March, April and May bearing golden yellow flowers on 7.5 cm to 10 cm long racemes. The leaves are pinnate and 15 cm-to-12.5 cm long in the case of mature trees and 30 cm-to-45 cm long in the case of young vigorous plants.

The flowers and the fern-like foliage provide an admirable accompaniment to flower arrangements, whether the latter are designed on the Western or Japanese style. The tall avenues of *Grevillea Robusta* look most majestic and the scenic beauty of the poplar-lined roads of Srinagar can be brought about in the plains by planting this tree. *Grevillea Robusta* forms an impressive "Bonsai" (Japanese word for developing dwarf plants) by growing it in a pot and keeping it dwarf by a process of heading back, thinning, root-pruning and restricting food supply. In the U.S.A., it is used as a glass-house plant.

Delonix Regia : "Gul Mohur"—Leguminosae

"'Gul Mohur" or the Flamboyant tree is a deciduous tree which awakens to life at the inception of spring. It then puts forth luxuriant vegetative growth bursting into splashing colours of orange-red or orange-yellow during May-June. It is a native of Madagascar. Propagation is by seed and the tree is quick-growing. The tree attains a height of about 15 metres and flourishes in fairly dry conditions.

As the tree has a shallow root system, heavy winds can often blow it down. Consequently, it is not advisable to plant it on the roadside. In a garden, in areas susceptible to drought and heavy winds, it is desirable to enclose the plots with hedges or shrubs and plant the trees in groups inside the enclosure.

The leaves are compound and bipinnate—the young ones being light green and the mature ones, dark green. *Delonix Regia*, when planted in the company of "Mulsari", produces an impressive effect.

Cassia Fistula—Leguminosae
[*Golden Shower" :—"Pudding Pipe Tree"*]

Popularly known as the "Indian Laburnum" and flowering profusely in May and June, *Cassia Fistula* looks refreshing in the scorching heat of summer. This deciduous tree grows to a height of 10 metres or more and is very hardy. The pulp and seeds of the pod possess medicinal value.

Cassia Renginera—Leguminosae

Cassia Renginera, also deciduous, grows to a height of about 10 metres. It bears compound leaves and magnificent pink flowers, just before the onset of the monsoon and, in some places, in April and May.

Magnolia Grandiflora Fam. :— Magnoliaceae "The Queen of Mountains"

In the hilly regions of North India, as well as similar tracts in the South, nothing is more pleasing to the eye than the snow-white tufts of flowers borne on *Magnolia Grandiflora*. It can be called the "Queen of the Mountainous Landscape of India". To a layman, this plant is known as the "Him Champa".

Propagation is by seed as well as by *gooti. Magnolia*, in this country, has its home in the Himalayas. The genus comprising about 80 species of trees and shrubs are natives of Himalaya, East Asia and North and Central America. Coonoor, Mussoorie, Nainital, Pinjore and Dehra Dun are the places where this fascinating tree has been planted.

The canopy of laurel-like foliage looks magnificent with its bicolour effect, when the tree is not in flower, and with its tricolour effect when it has burst into white blooms. The tree looks a pretty landscape ornament. Added to its grandeur is the fragrance of the flowers which spreads over a long distance. The tree blooms to its full glory during the months of May and June when hilly areas are visited by people from the plains.

The flowers with an open centre and petals fully expanded, half-open blooms and buds resembling those of the lotus, adorn this tree. The flowers are solitary, terminal, large and are borne in profusion during the flowering season. Cup-shaped flowers, with usually concave petals, look extremely lovely. A bunch of flowers arranged in a flower vase, with its own foliage enlivens the atmosphere for a number of days.

A semi-shady as well as a sunny situation will enable Magnolia to grow to its full size if the soil is also fairly rich. At low elevations, it will grow in the form of a shrub. In the hills, the plant takes the form of a well-shaped tree. A semi-shady location in the Delhi climate will enable *Mangolia Grandiflora* to grow into a bush form. The bush form, with a bicolour effect looks highly impressive even when it is not in flower.

Magnolia Grandiflora is evergreen and the green foliage itself is fine for decorating vases during summer months when flowers usually wither. The plantation of *Magnolia Grandiflora* in clumps can lend great enchantment to the surroundings.

Plumeria Acutifolia : P. rubra, acutifolia—Apocynaceae

This is a dwarf tree which starts bearing funnel-shaped, white and marginally and centrally-tinged yellow flowers of sweet but mild fragrance. It is a deciduous plant which is at its best during the summer. The leaves are long, stiff and attractive. The flowers retain their fragrance even after they fall down. It is popularly known as "Khair Champa", the "Temple Tree" or the "Pagoda Tree". Propagation is by cuttings which, with a little care, develop into plants in one season. The cuttings take root very easily and quickly.

Plumeria Rubra, popularly known as the "Frangipani Plant" (the West Indian Jasmine), which is smaller than *Plumeria acutifolia* produces from April to May brilliantly-coloured crimson flowers with a golden-yellow centre.

Plumerias are highly useful for planting in groves, or clumps. The flowers are effective in schemes of interior decoration. Since the leaves are pretty, *Plumerias* can be used as decorative pot-plants.

Rainy Season Flowering Trees

Saraca Indica—Fam. :—Leguminosae

Saraca Indica, popularly known as "Asoka", is a favourite tree in India which is the land of its origin. It is evergreen, medium-sized, possessing 15 cm to 24 cm long leaves which are brownish-red in earlier stages and dark green on attaining maturity. They present beautiful tints of two colours. The flowers are rich orange which turn orange scarlet later. Mildly sweet smelling and borne, during the summer months, on pendulous clusters, the leaves look very picturesque.

Saraca Indica can be trained into an admirable dwarf pot-plant and used for decorative purposes at suitable sites. The flowers are matchless for adorning hair-buns and locks.

The "Asoka" trees can easily be raised from seed. A semi-shady and a sheltered location is good. It does better in moist areas blooming prolifically but in dry areas and situations, exposed to drought, the tree hardly flowers satisfactorily.

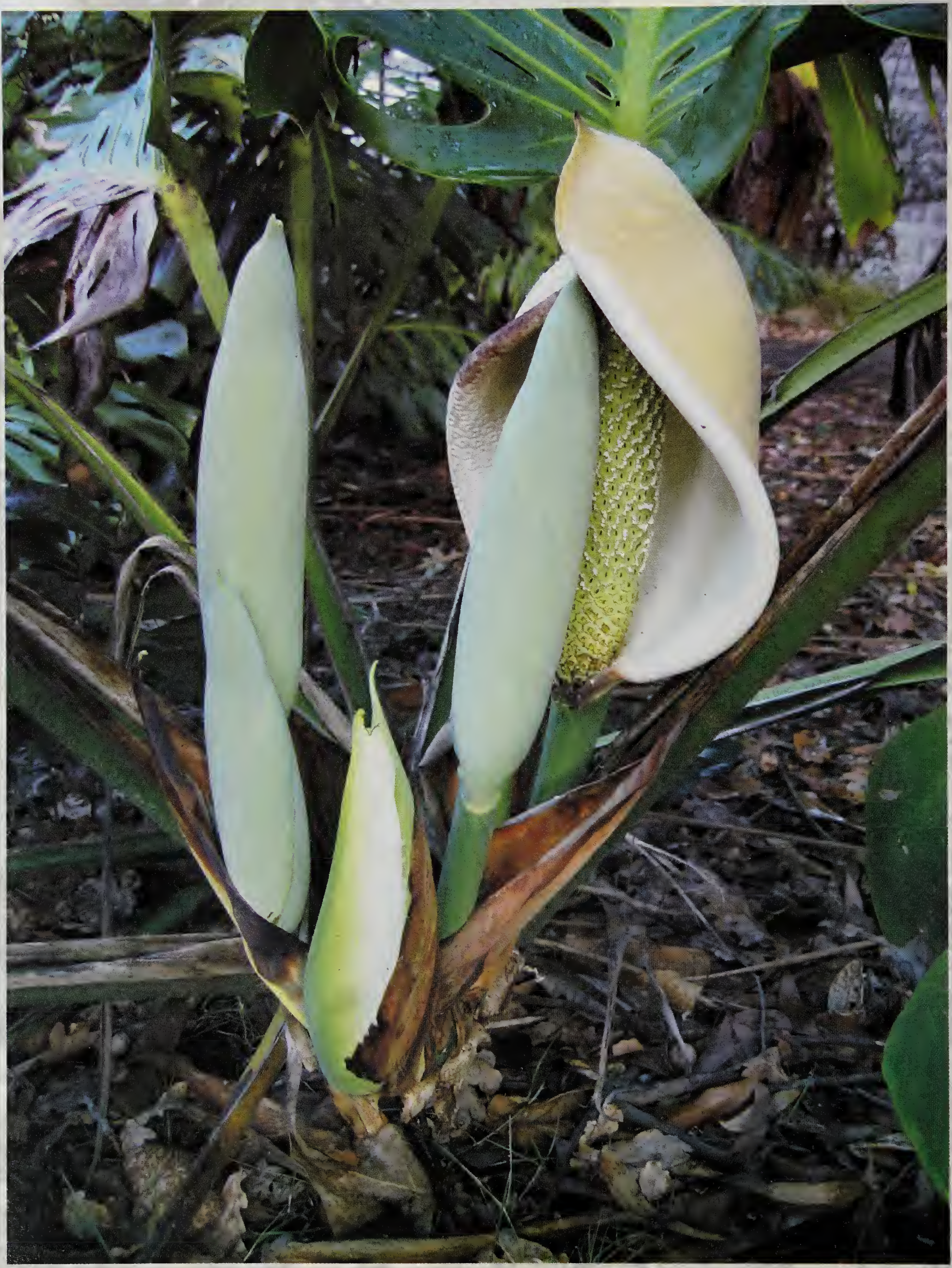
Alibizzia Lebbek : Acacia lebbek or Acacia speciosa—Fam. :—Leguminosae

With flowers of a fascinating tint of light-greenish-creamy-yellow and exuding a pleasing mild fragrance this tree is popularly known as the "Lebbek Tree", the "Siris Tree", the "Woman's Tongue Tree" and as "Vahai" in Tamil. It is the pride of the garden during summer months in the plains of North India. Its perfume is more pronounced at night time. This deciduous tree has been named after the

Chrysanthemum

Rock Setting

Dracaena



Monstera

Italian naturalist, Aibizzia. It has its home in Tropical America, North Australia and Tropical Asia. Each leaf has 4-8 pinnate and each pinna, produces 6-10 leaflets.

The genus comprises about 25 species of trees and shrubs having their origin in Tropical Asia, Africa and Australia. In India, Aibizzia Lebbek is grown as a thick-spreading tree providing shade in summer and for filling the atmosphere with a sweet smell in tropical and sub-tropical areas. *Aibizzia Lebbek* is therefore ideal for big gardens, parks and landscapes.

The posture of the flower is charming. The flowers look extremely lovely as small globular knot-like structures in the bud stage. In tropical regions, the tree grows about 27 metres tall; in sub-tropical areas the size is smaller and in the arid areas, it grows into a wonderful looking medium-sized tree. The branches are at delightful angles enabling the tree to form a beautiful green canopy. Propagation is by seed contained in 15 cm to 30 cm long pods which are released towards the end of June.

Alibizzia procera is a beautiful tree of the Deccan area. *Alibizzia stipulate* is a popular tree of Assam where it is grown in order to provide shade in tea plantations. In Southern India *Alibizzia moluccana*, capable of growing to a height of 30-33 metres, is planted for providing shade to coffee plantations.

Lagerstroemia-flos-reginae : "The Pride of India" ["The Queen's Flower"]

Popularly known as the "Pride of India", this tree is the glory of the rainy season. It then produces extremely refreshing purple flowers, in great profusion. It also flowers intermittently in the months of April and May in the plains of North India. The tree sheds its large leaves in autumn but before that, the foliage turns red. The tree is very hardy, slow-growing in the initial stages, but fast growing later. It is ideal for planting along the banks of streams and ponds, in clumps, in ornamental gardens and parks.

Lagerstroemia thorelli, which attains a height of five to seven metres, produces purple and white blooms, throughout the rainy season.

Winter Flowering Trees

Bauhillia Purpurea (Leguminosae)

A native of India, Burma and China, it is one of the finest small-to-medium-sized trees attaining a height of five metres or more. The leaves are leathery and bilobed. The flowers are fragrant, deep pinkish-red and are borne profusely during winter in auxillary or terminal *corymbs*. One of the petals possesses white streaks on the claw.

In the Delhi climate the tree starts blooming in the month of November covering the tree with lovely flowers for a couple of months. In Calcutta also it flowers during winter. The flowers possess a great lasting quality and can be used for interior decoration. The unopened buds add great charm to the composition.

Propagation is easy by seed. A three or four-year-old plant starts blooming freely. A sunny location and well-drained soil are needed.

Mimusops Elengi Mulsari : (Fam: Sapotaceae)

"Mulsari" is a magnificent useful tree of Indian origin. It is evergreen and gives thick shade. Its flowers are very charming. They are tiny, star-shaped and shower very sweet fragrance all around. A scent is extracted from them and hence, the tree is of a great commercial value also. The tree blossoms in clusters of dropping blooms twice a year, once in summer and a second time in winter.

It is not difficult to increase it by seed. The tree attains a height of about 16 metres and assumes a delightful form and spread. The foliage is leathery, evergreen and shining. Its natural posture in full-fledged size and during mid stages of growth is superb. Slow growing in the initial stages, the sapling throws out quick growths after a couple of years. By clipping, trimming and training, artistic and elegant shapes can be evolved. At the Gardens in Rashtrapati Bhawan, New Delhi, pretty umbrella shapes are formed out of this tree. The Moghuls too were fond of planting them in the garden meant for their own recreation. Old trees of Mulsari can be seen in the gardens of Red Fort, New Delhi. The flowers give out a unique sweet smell. These flowers are useful for making "gajras" for hair-locks and buns. Its fruit is edible and ornamental too.

Chorisia Speciosa Malvaceae Bombacaceae

The genus consists of about three species which are natives of Tropical America. The trunks are characterised by having prickles and the foliage is degitate with five to seven leaflets, possessing entire or toothed margins.

Chorisia Speciosa is an ornamental tree of Brazil. It is medium-sized, bearing long-stalked lanceolate and toothed leaflets. The flowers are solitary, 7 cms to 13 cms across, and are borne in the axils of the leaves. The calyse is irregular and the corolla is spreading with five petals of a pinkish purple or red shade and yellow and dark shaped at the base region and silky on the inside. The back is hairy and possesses brown dark rays. The individual flower looks highly orange. The tree starts flowering in November in tropical climate. It is in full bloom towards the end of November or in December. The fruit is a pod which contains soft silk cotton which is used for cushions and pillows. Propagation is by seed. A rich loamy soil is needed.

Alstonia Scholaris

Alstonia Scholaris, popularly known to the gardener as "Anjan", is of Indian origin. It is laden with highly-fragrant flowers in early winter in the plains. The flowers are small, greenish-white, salver-shaped, borne in terminal *cymes* and capable of exuding a delightful fragrance over long distances. Attaining a height of 17 to 20 metres, the tree is majestic, bearing evergreen and ornamental foliage. Each whorl has six to seven leaves. Each leaf is elliptic-oblong, 10 cm to 20 cm long, 25 mms to 37 mms wide and prettily-bicoloured, being green above and whitish underneath.

A single tree planted in a corner in a home garden greatly enhances the beauty of the overall composition, besides producing sweet smelling flowers at a time when there is dearth of such blooms. A venues of *Alstonia Scholaris* look majestic in big ornamental parks and in public gardens. By heading back these trees, lower height and bushy and compact shapes can be maintained.

Soil consisting of loam, peat and sand is suitable. Cuttings take root in sand easily.

IX

Verandah Gardening

A VERANDAH HAS an advantage over a room as the former with two or three sides open can have more of sunlight and a more free passage of air. This gives wider scope for the use of plant material. Persons without garden land can grow plants of their choice in artistic receptacles thus satisfying their love for greenery and colour. Drabness can be avoided.

Dwarf trees, shrubs, bulbous plants, seasonal flowers, cacti, succulents and decorative foliage pot plants can be utilized for adorning a verandah. Pot-grown climbers can be trained so as to clothe walls with greenery and colour. Hanging baskets and flower pot-stands of different designs and sizes can also be introduced in the scheme of verandah gardening to add variety.

Perennials having ornamental foliage are an asset to verandah gardening schemes. The diversity of their colour, their admixture in a manner as to produce exquisite blends and contrasts and their lovely flowers make these plants indispensable for the verandah.

The suitability of particular plants to particular situations should always be kept in view. Proper grouping of plants is essential to obtain a pleasing effect. Overcrowding has to be avoided as this will breed repulsiveness and also encourage insects to harbour on the plants.

Colourful Foliage Plants

Plants, the foliage of which is pretty-coloured, stand the gardener in good stead in beautifying a variety of situations in the verandah. They can be used as pot plants for purposes of accent or for making other interesting compositions.

Some of the more fascinating types of coloured foliage plants are described below.

Acalyphas—Euphorliaceae

Acalyphas are valued highly because of their pretty foliage. Plant in artistic receptacles. Select the receptacles judiciously so that the colourful foliage or blooms of the *Acalyphas* are not eclipsed by the colour and pattern of the receptacles.

Acalypha wilkesiana : Produces long slender spikes of brownish-red flowers. However it is the ovate fascinating-red leaves with patches of crimson and bronze and margined with serration, that steal the show. There are many varieties in

Acalypha wilkesiana, bearing coppery green foliage with a mottling or blotches in different shades, viz., brown, crimson and red.

Acalypha wilkesiana grows to a height of 1.5 metres to 3 metres or more. It is not difficult to increase the species by cuttings, during the rainy season.

Acalypha wilkesiana macafeana, commonly known as "Copper Leaf" looks beautiful almost throughout the year. *Acalypha wilkesiana macafaena* is a stout-branching bush but compact.

If *Acalyphas* are clipped in March-April, they will attain the prime of their beauty towards the rainy season and after. If left unclipped, they will look a bit dull during winter. The size of the leaves will reduce considerably if placed in an open situation. With spring, however, they will start looking fresh and, by summer, will be in full grandeur. This elegance will be maintained up to winter. When *Acalyphas* are clipped, they take quite sometime to resume this majestic effect.

Thus, by clipping some plants in March-April and leaving some unclipped, *Acalyphas* can be exploited to adorn the verandah almost the year round.

Citrus Limonia—Rutaceae

This shrubby tree, height 2.5 metres to 3 metres, is grown in ornamental gardens for the beauty of its variegated foliage and the posture of its branches which assume artistic angles. Capable of growing well in fairly large receptacles it is suited to verandah gardening. Grouped with a winter-flowering shrub like *Dombeya aliporensis,* it contributes richly to a grand combination. The leaves of citrus *Limonia Variegata,* a particular variety, shine majestically almost throughout the year.

It bears oval or oblong pulpy fruit. The juice of the fruit can be used for making lemonade, the rind for cooking and the oil for cooking and perfumery.

Citrus Limonia, relishing a sunny location and a warm climate, cannot stand a cold climate. It can be raised well in the plains of Northern and Eastern India.

Hibiscus Rosa-Sinensis: (Variety "Snow Queen") Malvaceae

Among *Hibisci*, there are a few varieties possessing ornamental foliage and lovely blooms.

The plant is bushy with foliage toothed, broad and vate. The flowers rose-pink-red in colour, are small and single.

With the advent of spring, in the plains of Northern India, the leaves of Hibiscus—"Snow Queen" almost green throughout winter, start showing signs of mottling with a whitish colour at the edges. With the increase in heat in early summer, the green is eclipsed, and the whole plant seems to wear a costume of white. However, the leaves which remain in the shade remain green and if the shrub is in a location where sun and shade co-exist, the white and green foliage contrast magnificently.

Excoecaria Bicolor—Euphorbiaceae

With foliage of deep crimson underneath and bright olive-green above, *Excoecaria Bicolor* is popularly known as "Blinding Tree" and "River Poison".

The genus consists of over two dozen species of tropical shrubs or trees having poisonous milky juice. Its use as a cultivated plant in ornamental gardens is therefore limited.

The shrub attains a height of a metre to metre and half and the flowers are inconspicuous. A semi-shady location is best for successful cultivation.

Excoercaria Bicolor can grow well in a 30 cm pot. When grown as an ornamental pot plant, an ideal situation would be a sheltered corner in the verandah during winter and summer and an open and sunny aspect during spring and rains. In places governed by extremes of temperatures, *Excoecaria bicolor* can grow well in the open under tall trees.

Coleus—Labiatae

Coleus are bushy compact plants, many of which are hybrids. Their foliage is delightfully variegated in form and in colour. The variety *Verschaffeltii of Coleus blumei* is bright purple red while *Golden Bedder* is lemon yellow turning golden yellow in free sun. The plant can be easily grown from seeds or cuttings. Coleus can withstand admirably hard clipping for weaving artistic shapes.

As the plants grow older, cuttings should be taken for propagation and the rest of the plant should be discarded.

Eranthemum-Albo-Marginatum-Acanthaceae

Eranthemum-albo-marginatum possesses pleasing grayish-green leaves bordered whitish, red or yellow.

Ordinary garden soil and a semi-shady to shady location are good. *Eranthemun-albo-marginatum* can be increased by soft wood cuttings during spring and rains.

This plant can stand the openness of the atmosphere of winter in Bengal but not of North Indian plains, where overhead cover is needed. With spring, it can be brought back into the open. Treated this way, the plant can keep up its elegance almost throughout the year.

Euonymus Japonicus (Variety) : (Medio-Pictus)—Celastraceae

Erect in posture, the many-branched *Euonymus japonicus* var. "*...media-pictus* with every branch very artistically diamoned is..." eminently suited to semi-shady to sunny locations. The foliage is thick-textured and bordered brilliant green all around.

In the variety *albo-marginatus* the leaves are yellow margined with white.

The flowers in *Euonymus japonicus* are greenish white in colour, the globose pink fruit, however, is ornamental.

Euonymus Japonicus, a native of Japan, is an evergreen shrub. It creates an excellent effect for ornamental verandah gardens, being able to stand chapping extremely well. Cattle, however, relish its foliage.

Polyscias Balfouriana Marginata—Araliaceae

Highly-decorative, straight-stemmed, spineless, branched, quite compact, leafy and clothed with foliage, firm base to apex are the qualities of *Polyscias Balfouriana Marginata*. The plant has its home in New Caledonia. The leaves are greyish-green, bounded by an irregular margin of creamy white.

In the plains of North India, the shrub has to be protected against intensive heat and cold. In humid regions, it can be placed in the open-exposed position.

It is propagated by soft wood cuttings. Ordinary garden soil will do.

Bougainvillea (Variety Thima)—Nyctaginaceae

Possesses foliage with blotches of a delightful yellow in the heart region and bordered green. The plant looks highly ornamental because of its exquisite foliage even when the plant is out of flower. The colourful bracts of the flowers are bicoloured and the plant looks extremely charming when in full bloom with bicolour foliage and bicolour bracts of blooms. A combination of five colours, viz., cream, yellow, white and purple is thus provided. A sunny corner is ideal.

Canna Trinacria Variegata—Cannaceae

Among Cannas, it is in *Canna trinacria variegata* that the foliage is beautifully striped green and yellow. These leaves are so pretty to look at, both from their shape and the stripes that they are admirable for indoor flower arrangement. *Canna trinacria variegata* also produces yellow blooms.

The plant needs a moist and sheltered place and can be grown very successfully in 30 cm pots.

Pandanus Veitchii—Pandanaceae

Member of the family to which belongs the popular plant of Korea Pandanus Veitchii is a pretty-leaved species having its home in Polynesia. It was introduced by Veitch in 1868.

The leaves are centrally-streaked in a smaller or larger area with a refreshing light-green to deep-green shade having a mixture of creamy white. Each leaf is thin, leathery, about 7.5 cms wide, 30 cms long, possesses saw-edged margins and is spined in the mid rib-region on the under surface.

The foliage rise in the form of a rosette, in which some leaves are in a recurved pose and some are straight. Some leaves, especially the mature ones, turn green, darker in the central region and lighter on the periphery.

Begonia Rex—Begoniaceae

In Begonias, the species *Begonia rex* has a multitude of varieties with different foliage forms. The leaves may be single-coloured or multi-coloured. In *Exotica,* otherwise knowns as the *Pictorial Pyclopedia of Exotic Plants* written by Alfred Byrd Fraf, about 90 types of *B. rex* have been described.

Begonia rex is a rhizomatous plant. The foliage is heart shaped, 20-30 cm long, 15 to 20 cm wide, dark olive-green and possesses a metallic sheen. The Begonia rex of Assam is famous for its dark olive-green leave. *Begonia rex* has given birth to numerous hybrids of merit as a result of its crossing with related species.

Begonia versicolor is a species having its home in China and is popularly known as "Fairy Carpet Begonia". The roundish foliage is delightfully corrugated and the colour is a symphonised combination of emerald-green, bronze and silver.

To be grown successfully, the plant needs a highly humid atmosphere.

Duranta Plumieri (Variety : Variegata)—Verbenaceae

Duranta plumieri is an eye-catching shrub whether planted outside or in a pot. The variety *Variegata* has green leaves with irregular-sized stripes of creamy yellow running along the upper and lower margins.

This trait along with other qualities such as flourishing well in shade, spineless, producing blue blooms and golden berries and the flower and fruit sometimes appearing together, has made it an indispensable selection for a variety of situations in the verandah.

Crotons—Euphorbiaceae

Crotons are clothed with very beautifully-patterned and artistically-shaped foliage that a point of vantage has to be provided to them in any scheme of decoration. The variety in colour is also unlimited. The special characteristic of crotons is that the foliage on a single plant is tinged with an admixture of shades. Clumps of crotons may be planted in properly-shaped enclosures. The foliage which has a lasting quality can adorn vases.

Some exquisite varieties of crotons are grown with ease in Bangalore, Bombay, Calcutta, Hyderabad and the Andaman and Nicobar Islands. Crotons can be grown in the plains of North India and in hill stations, if precautions are taken to protect them during extreme winter. The temperature most suitable is 60° to 70° F. Crotons relish a humid atmosphere. Any type of garden soil will generally suit crotons. Sunlight is, however, essential in order to enable the plant to bring out the fascinating shades in its foliage.

Propagation by cuttings and layering is generally in vogue, in the rainy season. For producing compact and bushy plants, cutting back and pruning should be done. When propagated by cuttings, terminal cuttings about 2-2.5 cms in length made from the terminal growth, are placed in a soil mixture of equal quantities of leaf mould and sand.

The roots of a croton plant need protection from the cold. As such, the pots should be banked with grass. In the plains of North India, most of the crotons drop their leaves in winter. At that time they may be shifted to a covered situation if they were in an exposed place in the verandah. Mulching is recommended at the ground level close to the roots. Treated this way, crotons will awaken to life on the advent of spring. Crotons can be brought out in an open situation when the new growth starts in spring and there is a little warmth in the atmosphere. Watering should be liberal so as to create moist conditions which are very favourable for them to grow to perfection. Old plants can be rejuvenated by heading them back and by proper manuring.

Under dry conditions, the Red-Spider-mites ruin the plants. Thrips is another menace to Crotons.

Sanchezia Nobilis Variegate (Sanchezia Nobilis glauco-phylla)-Acanthaceae

The green foliage in variety *glaucophylla* is variegated with yellow or white. The plant relishes a shady corner in the verandah although partial sun is not harmful. A sheltered position is essential as extreme cold or heat harms the foliage. A receptacle 30 cms in diameter and of the same depth is ideal. Cuttings of soft green wood inserted in sand during the rains take root quickly.

Dieffenbachia—Araceae

These are tropical evergreen plants with strikingly-variegated foliage. Propagation is by planting suckers individually in 10-15 cm pots in a soil mixture consisting of loam, peat and leaf-mould in equal parts with the addition of sand. The soil should never be kept dry.

The 45 cm long and 23 cm wide deep-green foliage, dotted or blotched whitish, lend an enchanting look to *dieffenbachia sequine* variety nobilis. *Dieffenbachia sequine* is popularly known as the "Dumb Plant" or "Dumb Cane" because chewing any part of the plant produces a feeling of dumbness. The *baraquiniana* variety has 15 to 30 cms long, 6 to 15 cms wide, shining green foliage with irregular white.

Pleomele Reflexa Variegata "Song of India" Fam. :—Libiaceae

A native of the tropical regions of South India and Ceylon, *Pleomele reflexa variegata* has lovely foliage, bordered on either side and around the apex, by a band of golden yellow or cream colour; the central region being green. The plant, climbing in habit, is a branching type.

In schemes of verandah gardening, planted in a suitable receptacle and placed along the wall, it adorns the place admirably. In regions of extreme winter and summer, a sheltered location is necessary.

Amaranthus—Amaranthaceae

Relishing an open and very sunny location and a rich soil, the Amaranthus species are grown more often for their eye catching variegated foliage. Some species assume pyramidal shapes. *Amaranthus tricolor*, (Joseph's Coat) is exquisite because of its foliage donning brilliant colours of red, green and yellow. The plants take one and a half to two months to come into flowering after the sowing of seeds. Seeds can be sown from February-March onwards. *Amaranthus-trirolor* is quick growing, requiring copious watering. For borders in summer and in the rains, *Amaranthus tricolor* is an ideal choice.

Amaranthus caudatus "*Love-lies-bleeding*". A native of tropical south-east Asia, *Amaranthus caudatus* has a beauty of its own in its foliage and flowers. The showy green leaves exhibit a variation in shape, from ovate to ovate-oblong. The red flowers are very striking. The length of the floral region often equals the length of the plant itself.

The plant takes two-three months to come to the blooming stage after the sowing of seeds. A rich soil and plenty of watering are needed.

Sansevieria Desertii—Liliaceae

With orchid-like white blooms, opening as the evening approaches in the month of April, remaining in full grandeur throughout night and morning, closing during day-time and showering their delightful fragrance around while the flowers remain open, are characteristics of *Sansevieria desertii.*

It is an African plant originating in Transval, Rhodesia. Belonging to the group of hardy succulents, *Sansevieria desertii* produces erect, cylindrical, sharpapexed, 9-12 groved leaves of a sun-burnt green colour. *Sansevieria desertii* is a plant wherein the leaves possess an air of wildness with pleasing texture and form. The flowers are magnificent.

Chlorophytum Cosmosum: "Variegatum"—Liliaceae

The foliage is bicoloured with the central region a refreshing green and the outer border on either side a pleasing white. The leaves which rise in the form of an arching rosette are narrow and linear. The flowers are borne from March onwards. It is a characteristic feature of the species that the flowers first develop in the central region and then towards the apex and the base.

At the top of the inflorescence are tufts of foliage with aerial roots. These can be separated and planted as new plants. The plant can be increased by seeds, offsets and by division also, during spring or rainy season.

A rich sandy loam is suitable. An open location in tropical areas and a semi-shady to shady location in the plains of North India and other plains with distinct cold and hot weather, is ideal. It forms a highly decorative pot plant besides being suitable for planting in clumps in a small rockery corner of a capacious verandah.

Liriope Muscari Variegata: "Variegated Lilly Turf" Fam. :—Liliaceae

The leaves are grass-like, 45 cms long and green in colour, possessing a yellowish basis and margins. *Liriope muscari variegata*, a native of Japan and China is a tuberous rooted perennial. It grows well in a sandy soil in a semi-shady to shady situation. The plant also bears lovely flowers. The flowers are of a soft lavender colour and are borne on erect purple spikes taller than the leaves.

Planted in rock pockets in schemes of rock gardening and hanging baskets, the plant looks very effective. It is very suitable for use in schemes of room and verandah gardening.

Mimusops Elengi—Sapotaceae

Mimusops elengi, popularly known as *Mulsari*, has a variegated form in which the leaves are blotched green and creamy white in an artistic pattern. The leaves are shining and leathery. Grown in a 30 cm pot or a mosaic tub the plant can be headed back and clipped so as to form a beautiful evergreen umbrella of variegated leaves.

Placed in a sunny location, the plant will produce tiny star-shaped highly-fragrant blooms once in summer and a second time in winter. The fruit is highly ornamental and edible, too. Round oval or pyramidally-trained plants provide variety to a verandah garden collection. Easy to be grown from seeds, propagation can be done by layering also, during the rainy season.

The flowers that fall can be beaded for making *gajras*, for decorating hair buns and lock of women and children. A few flowers placed in a bowl in the drawing room will fill it with its sweet smell.

Caladium—Araceae

The leaves of Caladium come in clear or a pleasing mixture of colours. Some species are blotched and some dotted very artistically in alluring patterns.

Grown in matching bowls or other receptacles, the long and short-stalked leaves form a gorgeous rosette.

Propagation is by rhizomes to be planted in 22.5 to 30 cms pots in a soil mixture consisting of loam, leaf mould, decomposed manure in equal parts and some sand and charcoal. Tuberous rhizomes, cut into pieces and each having a bud on it are planted in May in the plains of North India and earlier in places like Calcutta. Bombay, Hyderabad and Bangalore. In the early stages of its growth, the Caladium needs a shady place and after establishment a sunny aspect.

As the foliage starts withering in winter, watering has to be stopped. Rhizomes can be collected a few days after the leaves have completely decayed and died. They should be properly dried before being stored.

Tradescantia Virginiana—Commelinaceae

With bicoloured foliage, light green above and purple on the lower surface this plant is a picture of beauty. The main stem grows upright from the base. The plant bears white flowers which remain concealed amongst the coloured leaves.

A site accessible to light and free passage of air is desirable. Propagation is by 2.5 to 5 cms. long stem cuttings which should be put in 15 cms pots during spring or the rains.

Cordyliles Liliaceae

A large spectrum of colour and foliage forms in various varieties is the characteristic of Cordylines. The genus provides the garden lover with excellent material for a shade garden in the open and conservatory, and in the herbarium and verandah for ornamentation.

The Cordyline specie possessing narrow recurved leaves is very effective for table and room adornment. For decoration of vases, the foliage by themselves, or in clusters with wild flowers, stand the interior decorator and the gardener in good stead.

So closely allied to Dracaena and similar to it in cultivation is Cordylines that it is very difficult for a lay-man to distinguish the one from the other. In Cordyline the flowers are smaller and the rootstock is creeping. The rootstock is not creeping in Dracaena. In Cordyline, the inflorescence possesses three bracts at the base, while in Dracaena, these bracts are absent.

The genus has over a dozen species of evergreen shrubs or trees which are natives of India, Malaya, Polynesia, South America, Australia and New Zealand. *Cordyline terminalis* is indigenous to India and its other homes are Malaysia to Polynesia and Tropical Asia. Popularly known as the "Sandwich Island Tea Plant", *Cordyline terminalis* is the commercial "Red Dracaena".

The erect stems of this plant have a clustered mode of bearing. The leaves are thick-textured, acute and generally green but some varieties reveal many fascinating shades of reddish purple. The new and young growth is of a exquisite rosy crimson colour. Flowers are lilac and are borne in panicles. They are white or reddish. The result is a berry globose in shape large in size and red in colour. The roots are eaten by some sections of the people.

Many a promising variety is met with in this species :

Amabilis : The leaves are green but they develop spots in colours of white or rose thus imparting tinges of these shades to the broad leaves. *Alorwoodiensis* : The leaves are crimson-stalked and beautifully-striped with green and yellow. The margins of the foliage are also of a delightful crimson *baptisii* : The recurved leaves are dark green with some yellow and pink streaks or stripes. The stems are variegated. In *Cordyline ensifolia*, a common shrub of Calcutta gardens, the elegant green strap-shaped leaves are borne on the top of the stem in crowded whorls. The flowers are produced in the month of February in dense spikes of minute white flowers. Moist and warm humid conditions suit these plants best.

Propagation is by cuttings of the ripened stems in the rains. These should be stripped of all foliage and planted in sand in a light soil in propagation boxes.

Soil consisting of a good turfy loam (three parts), well rotted cowdung (one part) and a sufficient quantity of sand is good.

Pterospermum acerifolium : "Kanak Champa"—Sterculiaceae

Nature has endowed the foliage of this tree with beauty by making it dark green above and silvery greyish, white or shining white underneath.

Another characteristics of *Pterospermum acerifolium* is that it produces in summer in the plains, highly-fragrant blooms which open fully during night and fall by morning. The leaves are irregular and the flowers are borne in groups of three.

Pterospermum acerifolium is an erect, quick-growing medium-sized tree. By proper training and spacing of branches, a compact ornamental bushy plant can be grown. An open and sunny location is desirable. Propagation is by seed.

Pterospermum acerifolium is an asset in creating pleasing plant compositions in verandah by placing it in the corner and arranging other decorative plants in a semi-circular or present form in a descending order. Another method is to allot it a central position and arrange other plants so as to form an alluring grove.

Zebraina Pendula : Tradesscantia Zebrina

Popularly known as the "Wandering Jew", *Zebrina pendula* a native of Mexico, is a fleshy "trailing" perennial possessing very pretty foliage. The leaves are dark green to purple on the upper surface with two broad shining silvery bands and purple underneath.

A light rich soil is relished by *Zebrina pendula*. The plant can be increased by stem cuttings. The roots develop at the nodes and the plant spreads in all directions thus covering huge areas admirably in semi-shady sunny locations.

Being a trailer it is a good choice for hanging baskets. It produces a sheet of delightful colours and looks one of the prettiest verandah plants.

With an upright pot-grown plant of *Sanseveria* in the middle and two plants of *Zebrina pendula* on the sides, an interesting plant composition is created. This can be used effectively in verandah corners.

Pedilanthus Smallii : Fam.: (Euphorbiaceae)

Pedilanthus, popularly known as "Bird Cactus" because of its somewhat closed and spurred involucre resembling a bird's head, has two types namely *Pendilanthus smallii* and *Pendilanthus tithymaloides* in which the foliage is variegated white. Since the vegetative growth is not luxurious, the plant looks neat and tidy.

With grey-green foliage the blade of the leaf margined white and also variegated with white and edges turned upwards, *Pedilanthus smallii* forms an attractive succulent plant. It is a native of Brazil. The genus comprising about three dozen species including some succulents, is closely allied to Euphorbia. The characteristic of the genus is that the plants contain a milky fluid called latex. Its leaves are not eaten by cattle because of acrid acid in this milky fluid. The plant is very hardy. Propagation is easy from cuttings.

Strobilanthes Dyerianus—Acanthaceae

The foliage of *Strobilanthes dyerianus* contains tints of blue, lilac and rose-purple and attains a height of 60 to 75 cms with well-balanced branches. It looks majestic in a verandah corner, easily propagated from soft wood cuttings during the rainy season. Growth is quick. The plant remains elegant throughout the year if not exposed to drought and extreme cold. It requires a warm sheltered position with a free flow of air and light or partial sun.

Also popularly known as "Gautemala Rhubarb", "Physic Nut" and "Tartage" *Jatropha fodagrica* is tropical in origin. It needs a partial sun and shade and protection from extreme heat and cold. Sandy loam is the best soil. The plant can be easily propagated from seeds and cuttings.

Arundos—Gramineae

Arundos are impressive because of their ornamental foliage and glorious flowering panicles.

Popularly known as the "Giant Reed" *Arundo donax* is a tall grass with grey-green foliage. It has hairy tufts at the base borne on tall and stout stems three metre high.

The "Giant Reed" is a highly decorative plant if grown in a large-sized receptacle to suit its needs. The long white flowering panicles, at first white and turning reddish later will adorn any room.

The plant requires a sunny aspect and protection from hot winds and extreme cold.

The rootstalk is knotty. The plant is propagated during the rainy season by division.

The *variegata* is a smaller variety than *Arundo donax*. Its foliage is beautifully striped white and green. The variegata flourishes well in medium sized enclosures.

Arundo conspicua is slender or smaller than *Arundo donax*. The panicles are silvery white or yellow white and 30 to 60 cms long.

Jatropha Podagrica—Euphorbiaceae

The plant has ornamental peltate cordate foliage, 3 to 5 lobed. It bears orange red and scarlet blooms in long-stalked terminal oymes and also nut-like fruit. The 30 to 60 cms tall pyramidal stem has a metallic lustre.

White-sepallad Mussaenda—Rubiaceae

The characteristic of the Mussaendas is the one colourful sepel which is much longer than the other sepels. This sepel contrasts magnificently with the green foliage.

Mussaenda frondosa, which blooms from July to October bears small yellow flowers. The odd sepel is white in this case. The plant attains a height of about one metre. It relishes an open or semi-shady to sunny locations.

Mussaenda frondosa, is ideally grown in a 30 cms receptacle. The soil should consist of peat, leaf-mould and loam in equal parts, with sand added. The plant can be propagated from cuttings of soft and half-ripened wood during the rainy season. Propagation can also be done by seed.

Ruscus Hypophyllum—the "Butcher's Broom"—Liliaceae

The evergreen *Ruscus hypophyllum* loves dense shade thus proving invaluable decorative room plant and for a sheltered shady comer in the verandah. It is popularly known as the "Butcher's Broom".

Its pretty dark green leaves, borne on erect, hard and rigid branches is soothing to the eye specially in summer. Its foliage can be inter-mingled with flowers in any scheme of indoor decoration.

Ruscus will grow in any garden soil. Propagation is easily done by division during spring and the rains.

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Indoor Plants

What is the place of room plants in schemes of decoration? People possessing garden land may be keen to use room plants as a media of room decoration; for others these plants have an importance of their own, for these plants impart a natural grandeur to a room, the only space they possess.

Popular Room Plants

"India Rubber Plant" (Fam. :—Moraceae)

Ficus elastica, popularly known as the "India Rubber Plant" grows to a height of about 33 metres in nature. It is cultivated as a room plant by restricting the height from 60 cms to 2½ metres by heading back and pinching the growing branches. One or more stems can be kept, suiting a particular situation. The leaves constitute the most ornamental part of the plant. The foliage is brilliant green above and yellowish underneath. The leaves are leathery, 15 to 45 cms long and are enclosed in rosy sheaths in the early stages. These sheaths drop later. The foliage of the variety *foliis aureomarginatis* turns yellow 2½ cms from the margins during autumn. The foliage of the variety *variegata* combines yellow and white colours near the margins.

The young foliage branches sheathed by rosy stipules form excellent material in schemes of flower arrangements. With the onset of spring in Delhi, the new leaves sprout. The plants look refreshing and ornamental up to early winter. Extreme winter is not good for *Ficus elastica.* A drought-free situation should be provided in the room. Dust should not be allowed to remain on leaves. Propagation is done by planting 30 cms long shoots in a sandy loam with leaf mould added.

"Umbrella Plant" (Fam. :—Cyperaceae)

Cyperus alternifolius, is popularly known as "Umbrella Plant" or the "Umbrella Palm". *Cyperus alternifolius* bears graceful foliage.

Attaining a height of 30 to 120 cms, the "Umbrella Plant" grows in the form of a grove with ribbed, smooth and polished green stems. The leaves are grass-like, 10 to 20 cms long, 5 to 12 cms wide and are borne in a drooping manner, about 20 arising from a central point and spreading in different directions to form an involucre.

Brinjal

Lady's Fingers

Spinach

Coriander

Mint

Cucumber

Watermelon

Muskmelon

With the advent of spring, the new growth shoots up. The young growths look like closed umbrellas or lotus buds. On opening, they assume the form of opened umbrellas. The varying heights of the stalked foliage look picturesque in a receptacle. The young low-sized foliage branches look better than the old tall ones. The flowers borne in spikelets of brown colour arise from the involucre of leaves.

By combining judiciously the unopened new growth, the low-sized opened-out foliage and the fully-matured stalked leaves, an artistic and elegant arrangement can be evolved. The plant is capable of yielding these leaves and shoots, almost constantly from spring to early winter. Extreme winter is likely to prove fatal to the foliage.

The variety *variegatos* possesses stripped leaves. Sometimes they are entirely white. The variety *Cyperus gracilis* is smaller in size than *Cyperus alternifolius* and the leaves are also smaller, narrower and more slender.

Cyperus alternifolius looks forlorn during extreme winter. A hardy and moist situation is best suited to it. The plant spreads quickly and a single plant develops into a clump, in a short period.

Sansevierias—Liliaceae

Sansevierias are grown as room plants for their stiff, erect and decorative leaves which are green or variegated. They produce fascinating flowers during the monsoon and ornamental green berries in the cold weather.

Sansevieria zeylanica, popularly known as the "Bow String Hemp", produces lemon-white and mildly-fragrant flowers in the rainy season. It can be potted individually in a mixture of two parts of soil and one part of compost, with charcoal and sand added to it. The leaves are sword-shaped, 60 to 90 cms long, variegated or dulf green, possessing transverse markings of a greyish-white colour. The flowering scapes, which are longer than the foliage, are very useful for flower arrangements, whether the flowers are in the bud stage or are fully opened.

The variety *Laurentii* is more ornamental because of the presence of 6 mm to 1.25 cm wide creamy yellow bands along the margins of the foliage. *Sanse vieria cylindrica* produces about one-metre long, dark-green cylindrical leaves and creamy-white flowers which possess a pinkish tinge.

A shady or a dark spot is better than a place accessible to light. Draught is bad but a dry atmosphere is good. Excessive watering is likely to cause a rot at the base of the leaves. Avoid application of manure and use only soil for topping up, as and when necessary. Water only sparingly.

Aspidistra (Liliaceae)

"Aspidistras" have pretty foliage which is shining and stiff and variegated in some cases. It is a rhizomatous plant which in some instances is creeping. Because of the hardiness of the leaves it can stand dust, moderate heat, cold and draught well. The plant proves an ideal room plant. The foliage can remain fresh for more weeks. The leaves can be used in flower arrangement schemes.

Aspidistra lurida bears 38 to 50 cms long, evergreen, dark and oblong-lanceolate-shaped foliage. The growth is prolific and the plant develops into a majestic clump. In the extreme heat of the plains, if kept exposed directly to the sun, the leaves get scorched and turn dry and brownish, disfiguring the plant as a whole. In the early stages of growth the leaves are rolled very artistically. The flowers are lurid purple but they do not attract much attention.

In the variety *variegata* the foliage is striped green and white. It does well in a position accessible to light. A dark corner of the room is ideal but in shade too, the foliage grows to perfection. The variegated species must be provided with a poor soil as rich soil has a tendency to do away with the variegation. *Aspidistra typica* has a creeping root stock and 30—45 cms long leaves, which, with seven nerves, look interesting.

Propagation is by the division of the rhizomes in spring and the rains. Each piece carrying a few leaves should be planted in 15 cms pots and later shifted to 20 to 30 cms receptacles. Soil comprising a rich loam, leaf mould and sand is good.

Monstera Deliciosa (Araceae)

With perforations in a beautiful pattern, the large-sized leathery foliage, dark green when mature and light green when young, have rendered *Monstera Deliciosa* a room plant of great merit. Planted in an artistic bowl or pot and placed in a corner in the drawing room, it adds great charm to the surroundings. The unfolded new leaves in a curled condition look majestic. The soft green shade of the leaves contrasts well with the dark green colour of the mature foliage. The long-stalked leaf, in its fully developed stage, is 30 to 60 cms long and is cut pinnately.

Capable of climbing well and high, the plant covers any wall magnificently with a sheet of greenery. It sends out aerial roots, which in turn can be so trained, as to form a part of the wall decoration. The aerial roots have a tendency to attach themselves to the support and thus enable the plant to climb up or spread in different directions.

A well-drained rich soil is liked by *Monstera Deliciosa*, *Monstera Deliciosa* possesses adaptability, being capable of standing fuctuations of temperature. The fruit produced is 15 to 20 cms long possessing a cone-like appearance and a soft cream colour. It is edible, too.

Propagation is easy. The growing stems can be cut into pieces each possessing two three joints and planted horizontally in pots containing a soil mixture of sand, leaf mould and peat in equal proportions. A support is needed to enable the plant to climb or spread. During winter, the water supply should be reduced.

Decorative Cycads (Cycadaceae)

Among cycads, a group of ornamental plants of the tropical and sub-tropical regions, *Cycas circinalis* and *Cycas revoluta* are good room plants. By planting them in suitable receptacles, nice clumps of evergreen and artistically-cut foliage can be secured.

Cycas circinalis is a very hardy indigenous species thriving well in a rich moist soil and a warm position. Popularly known as the "Fern Palm". *Cycas circinalis* possesses a cylindrical trunk bearing a cluster of long, fem-like stiff foliage. The trunk grows to a height of two metres or more. Each leaf in its fully mature condition, is long-stalked, the length of the petioile being 45 cms or more and its shape triangular in the upper region and round in the lower part. The leaf bright green above and of a light shade on the lower surface grows a metre and a half to three metres long, bearing 80 or more leaflets. Each leaflet is 25 cms to 30 cms long.

The leaf and the leaflets have fascinating colours and shapes. *Cycas circinalis* is slow growing. In its earlier stages, the plant can be grown in a small pot. As growth increases transfer to a bigger pot becomes necessary. A single plant placed in the corner of a capacious room will form a picturesque ornament in any scheme of interior decoration. The male plant throws out a cone-like inflorescence of flowers. In the female, the inflorescence of flowers located in the central region of the crown is of a buff colour and tufted in appearance.

Cycas circinalis can also be placed in the verandah porch or in the open, in a semi-shady position. In the open, in regions of heavy frost, the leaves are killed. The crown, which remains uninjured, regains its activity at the approach of the warm weather and throws out new growth.

Cycas revoluta, popularly known as "Sago Palm", is the hardiest species among cycads. The leaves are recurved and pretty, about 60 cm long. Each leaf bears about 120 leaflets, with the middle ones being the longest, thus lending a graceful look to the entire leaf. The colour of the foliage is shining green on the upper surface. The trunk attains a height of over two metres. The male plant produces 45 to 50 cm long cylindrical inflorescences of flowers. In the female, the inflorescence is semi-globose. The bright-red nut-like seeds numbering 100 or more, produced by the plant, look highly colourful. The leaves are used in making floral wreaths and in schemes of interior decoration. *Cycas revoluta* can be used as a room plant in the manner suggested for *Cycas circinalis*.

Propagation of *Cycas circinalis* and *Cycas revoluta* is by seed and through suckers.

Dracaenas (Liliaceae)

Many species of *Dracaenas* are very effective as indoor plants with their foliage in exquisite colours. The species, bearing narrow and recurved foliage, are ideally suited for room decoration. Pot-grown species look very impressive in table decoration schemes.

Among *Dracaenas* two varieties, namely, *Dracaena fragrants victoriae* and *Dracaena sanderiana* must find a place in any collection of ornamental foliaged plants. *Draeacna fragrans victoriae* has leathery leaves which are soft to touch. The central region of the leaves is broadly-striped silvery gray. On either side run the border of a cream-to-golden-yellow colour. It is a slow growing species with pendant leaves which are pointed at the apices.

Dracaena fragrans masangna is a sturdy old-fashioned house plant. The leaves are pendant and arching forming a sort of rosette. They possess stripes and bands of a light green and yellow colour down the centre.

Dracaena sanderiana (syn. *Dracaenas thaloides* var. variegata) has shining, deep-green foliage having a milky tinge in the central region and the margins are broadly banded by white. This species has a long life. Its home is in the Congo and Cameroons. The leaves, which are narrowly-Ianceolate and long-petioled, arise in the form of a rosette.

Some other species which are effective as indoor plants are described below.

Dracaena fragrans (variety *Lindenii*) has 45 to 90 cm long and 6.25 to 10 cm wide, shining-green and recurved foliage, each leaf possessing medium-yellow or pale-yellow bands from the base to the apex and looking highly decorative. *Dracaenas fragrans lindenii*, has pendant foliage. The leaves are quite wide. Broad bands of greenish-yellow, often very inconspicuous, are present at the margins. The central region is green. *Dracaena concinna* attaining a height of about two metres, is compact bearing purple-stalked and purplish-red-margined narrow leaves which are of a sombre-green colour. Dracaena phrynioides is a dwarf type. It looks very attractive with leathery foliage, which is darkgreen spotted yellow above and pale underneath. *Dracaena goldieana*, an introduction from Tropical Africa, is an erect, unbranched slender-stemmed foliage plant. It has 20 cm long, 10 cm wide glossy green foliage, which is banded with dark-green and silvery-green stripes. The leaves before they open out possess a reddish or reddish-purple tinge.

Cultivation Practices

A well-drained rich loamy and lime soil, a site accessible to a free passage of light but not direct sun, a cool atmosphere and regular watering are pre-requisites for successful cultivation of this plant. Stem cuttings placed in sand during the rains will sprout quickly. The lower leaves will fall and the main stem will grow.

Propagation is by division of the creeping rootstock and node cuttings also. In node cuttings, the mature shoots are made into 2.5 to 5 cm long cuttings with a node on each cutting. Each such node cutting is placed horizontally in a sandy soil with the node pointing upwards. The soil is kept just moist but not wet. A soil mixture of four parts of old mortar, one part of leaf mould, three parts of loamy soil and one part of sand, with a little charcoal added, is ideal for *Dracaenas*. Sufficient moisture and heat are needed during the growing period so as to ensure quick and strong growth.

By pinching and heading back the growing branches, the tall growing *Dracaenas* can be kept compact, dwarf or medium-sized so as to form nice decorative plants.

Window Plants

Coleus (Fam. :—Labiatae)

Coleus, which present a variety of colours and forms in their foliage are ideal for a window garden scheme. *Coleus* grows easily from seeds and cuttings. Pinching, growing branches are helpful in the development of a bushy and compact plant. *Coleuses* can withstand hard clipping enabling them to be kept in artistic shapes.

The results with *Coleus* as a room plant are more encouraging if before shifting a potted *Coleus* to a room, the pot is placed in an airy and cool place for a week or 10 days.

As the plants grow older, they become leggy, with the leaves losing their brightness of colour. In such cases, cuttings should be made from the branches for propagation purposes. The rest of the plant should be discarded. The soil in the pot also needs replacement.

Coleus blumei, in heights varying from 30 to 90 cms, has toothed foliage, variegated with purple, yellowish-green or yellow and dull-red colours. There are numerous attractive varieties, many of them being hybrids. The variety *Verschaffeltii* is bright purple-red. "Golden Bedder" has golden-yellow foliage. *Coleus aromaticus* has succulent and fragrant leaves of a lemon-green colour.

Some Heliconias (Fam. :—Musaceae)

Heliconias are very effective for adorning any situation in a shade garden, green house, ferneries and as a decorative pot plant in a shady corner. It is ideal as a room pot plant.

The plantain or canna-like, broad, pretty foliage, beautifully-coloured, striped or marked, have made *Heliconias* suitable plants fit for growing in pots and in clumps. Shade is necessary as scorching sun-rays will burn the leaves. The cultivation of *Heliconias* in the tropical regions, in Bengal, Mysore, coastal Maharashtra, Andaman and Nicobar, and other places is a great success as compared to cultivation in North Indian conditions. *Heliconias* are in their prime of beauty during the rainy season, from July to September-October.

The genus consists of about 30 or more perennial ornamental foliaged herbs of American and Tropical Asian origin. Propagation is by seed and division of its strong rootstock, known as rhizome, during the rainy season. The divided rootstocks can be planted in 10 cm pots and, later, shifted to bigger ones when re-potting is necessary. A very moist and rich soil is needed for its cultivation. Watering should be done liberally during the growing period and sparingly from November-December to March-April. During the latter months, the plants go to rest without shedding their foliage.

Species of Merit

Heliconia augustifolia [Syn. *H. bicolor*] attains a height of about one metre or a metre and a quarter producing about 60 cm long, 10 to 15 cm wide, green, linear-oblong foliage. It is a perennial rhizomatous herb having its origin in Brazil. The flowers, borne in clusters of 6-10 surrounded by red bracts, are white or yellowish-green with orange stalks. The seeds are orange-coloured at first, turning blue at a later stage.

Heliconia humilis, a native of Trinidad and Brazil, is popularly known as the "Lobster's Claw". It is over a metre high with 60 cm long glabrous shining-green, oblong-acute leaves and erect flowers of yellowish-white surrounded by salmon-red coloured and boat-shaped bracts. *Heliconia illustris* [syn. *Heliconia rubrostriata*, (hort)] grows a metre to a metre and a half high, with 45 to 60 cm long leaves having distinct mid-ribs and veins of a brilliant colour. The prominent varieties in this species are :

(a) *Aureo-striata* has broad recurving foliage of a shining-green colour, the mid-rib possessing beautiful stripes of golden-yellow or ivory-yellow and pink and the transverse veins of ivory colour very distinctly visible on both sides.

(b) *Rubricaulis* possesses light-green leaves with mid-ribs of a pink colour and lateral veins of red or rose and petiole of a vermillion shade.

(c) *Edwardus Rex* has leaves of a deep-red colour with a coppery sheen.

(d) *Spectabilis*, a native of South-Sea Islands, has succulent, large-sized, dark-red stalked foliage of a bronzy-green colour. The mid-rib is brownish red on the upper side and of a wine-red shade on the lower surface.

Heliconia bihai [*Heliconia caribaea*] popularly known as the "Ballsier" and "Wild Plantain" has its origin in Brazil, West Indies, Samoa, New Caledonia, South America and the Pacific islands. It attains a height of three to five metres or more. The leaves resembling those of bananas, are a metre to a metre and a half long; the mid-rib is pale-yellow; the veins are lateral and slightly raised and the flowers are borne in an erect 60 cm long and 30 cm wide inflorescence of green or yellow flowers, surrounded by reddish boat-shaped bracts.

Cultural Practices

The room plants mentioned above can be kept in a healthy state indoors indefinitely provided care is taken with regard to their position in the room, soil and water requirements and other cultural practices. If such plants are to live under artificial conditions, they need special care which would allow them to adapt themselves to the changed surroundings.

Position of Plant

All plants require fresh air and light. Consequently the position in which plants are placed is important. They should never be placed close to fire places or places exposed to draught. A window is the best place for a room plant but it should not be subject to draught; otherwise, the plant will perish soon. On cold nights, the plants should be shifted to the middle of the room. If the nights are severely cold, the plants should be covered over with paper. Rotating the plant occasionally with a view to enabling all sides of the plants to get light is immensely helpful for uniformity in texture and colour display of various parts of the plant.

Soil

Though a few plants require special soil, the majority of room plants will thrive well in a soil composed of two parts loam, one part leaf mould and half a part of sand or charcoal. These ingredients should be well mixed before use. Before planting, it should be ascertained that proper drainage is provided. In the absence of proper drainage, the soil will become sour.

Watering

Care is to be taken with respect to watering of newly-potted plants, until the plant establishes itself. After this, the plant should be watered when the soil is moderately dry, once a day in summer and once or-twice a week in winter. A simple way of ascertaining the condition of the soil is to tap the side of the pot with a pebble or knobbed stick. If the sound is a clearing, it shows that the soil is dry enough to be watered immediately while a thud indicates that the soil is sufficiently moist. The water requirements of a plant will also depend upon the temperature of the room and the season of the year. Most room plants die because of improper watering. The use of lukewarm water in winter is recommended. During the period of dormancy, watering should be less as compared to summer.

Dust

Dust is the enemy of room plants. It is through the pores on the-surface of leaves that a plant breathes and perspires. If these pores are closed by dust particles, the plant will wither. The leaves should be washed twice a week with sponge or with a spray syringe. This practice also helps to keep away insects. Should an attack of insects be noticed, a solution prepared with water and a few grams of any insecticide will do. Standing the plants in the open during rains in summer is highly beneficial for the plant but this should not be done during winter.

Re-potting

Sooner or later, the plants require re-potting as they grow. In case the plants become too big, it should be transferred to the verandah or steps of the porch or else it should be planted in the garden. In the case of plants which require division, each piece should be planted separately in a pot. Too much root room should not be provided otherwise the soil will become sour and the plant will perish. Most of the foliage plants selected for a room need under-potting.

Ferns in Indoor Gardens

Ferns are suitable for "Indoor" gardening, for they will grow where no sun reaches at all.

The attractive foliage of ferns make them useful decorative pot-plants for the porch, the verandah and indoor areas. Ferns placed in metal pots make good decoration in drawing rooms.

Ferns range in variety from moss-size to that of a tree. Nephrolepis, polypodium and adiantun serve as fine pot plants.

Broadly, ferns are of two types: those which 'rest' during summer and those which remain green the year round. Evergreen ferns languish a little during hot weather. They can be kept in good condition by watering thrice a day, so as to keep the roots moist and by sprinkling cold water on leaves.

Ferns are native to the hills and to the plains. Not all hill ferns are suitable for the plains. It is equally difficult to grow some tropical ferns in the hills without a hot house. August and September are the best months for bringing ferns from the hills to the plains.

Ferns with brownish hairy stems as well as fine lacelike varieties do not take to the plains. The variety which has a tendency to creep or the one having stems with silvery hair or no hair at all is suitable for the plains in India.

Half-hardly ferns are not to be kept below a temperature of 40° F and tender ones below 60° F. The adianatum fern requires a humid and warm climate. The degree of warmth varies with each type.

Propagation

Ferns are propagated with spores, brownish in colour, present in capsules on the under side of fern fronds. Spores should be collected on white paper along with fronds when the sporangia are about to burst. A day or two after collection, a brownish mass emerges which should be sown in pans. The soil of the pans should have equal part of loam, peat, leaf mould and sand. The pan should be placed in a saucer of water and covered with a sheet of glass, with brown paper underneath. The glass sheet prevents drying of the pan. The pan should be kept in a dark corner.

Another method of propagating ferns is by division of roots at monsoon time.

The ferns grow well in deep loamy soil with sufficient leaf mould, peat and sand. The soil should be moist and well drained. While needing moisture ferns seem to dislike water lying stagnant around their roots. Air and light are essential but direct sun light is not desirable. The plant should be sheltered against hot and dry winds.

To keep fern plants healthy, the leaves should be sprinkled with water by using a very fine spray. The roots should be watered regularly to keep them moist. Old lime is very beneficial to ferns. Cow dung, however, spoils the fern.

For ferns in pots, the compost should include two parts of old mortar or concrete, one of leaf mould and one of sand. The mortar or concrete must be pebble size. One-third of the pot, from the bottom, should be filled with old mortar. The rest should be filled up to 2½ cms. from the top with compost.

Re-potting is advisable to accommodate the thick growth as well as to prevent the soil from getting sour. Re-potting should be done during the rainy season. To facilitate this, the pot should be watered thoroughly. Old fronds should be removed. Surplus roots may be separated and planted in new pots.

XI

Selected Vegetables

VEGETABLES ARE usually classified into different groups according to either their family or to the time of their sowing. However, a common classification given below which is based on the nature of the edible portions of the vegetables can be more easily understood.

Bulbs— Leek, Onion and Sweet Potato.

Tubers— Potato and Arthichoke.

Greens—Broccoli, Cabbage, Brussel's Sprout, Cauliflower, Bottle Gourd, Cucumber (Kheera), Bhindi, Ghia, Tori, Karela, Savorys and Kale.

Pulses— (i) Beans comprising Broad Beans, French Beans and Runner Beans
(ii) Pea

Root Crops—Beetroot, Carrot, Radish, Turnip, Parsnip, Swedes, Salsify and Scorzonera.

Salad— Lettuce, Mustard, Ceess, Endive and Cornsalad.

Leaf Stalk and Stem Crops—Asparagus, Celery, Rhubarb and Chicory.

Herbs— Mint, Parsley, Sage, Thyme, Marjoram, Fennel, Spinach, Coriander and Brinjal.

Crop Rotation

Crop rotation is of paramount importance for profitable vegetable cultivation. In order to get good-quality vegetables from the soil it is absolutely essential to evolve a scientific crop rotation formula, i.e., the same vegetables should not be grown in succession on a piece of land. The reasons are given below :

Crop rotation helps to produce good-quality vegetables for a series of years and at a lower cost.

Cultivation of the same type of vegetable for a number of years on the same land will leave the soil deficient in minerals and nutrients needed by that particular vegetable. Further, the minerals which are not needed by the same vegetable but which could have been utilised by another type of vegetable, had it been grown, remain unutilized.

Some vegetables like beans and peas add to the fertility of the soil as a result of fixation of atmospheric nitrogen by their roots forming nodule-like structures. These roots, which are rich in nitrogen, if left behind in the soil after the produce is harvested will enrich it with nitrogen. By growing peas and beans in different portions of the vegetable garden by rotation the soil where these vegetables are grown will be enriched with nitrogen. This, in turn, can be utilized by another nitrogen-loving vegetable like cabbage. For both beans and peas it is advisable to apply a moderate quantity of immediately-available nitrogen so that the plants can take root. Peas and beans need more of potash and phosphatic acid.

Some plants excrete a poisonous substance known as toxin. Growing one kind of vegetable on the same plot, in succession, leads to the accumulation of toxin which proves harmful to that very crop. These toxins, however, are harmless to some other crops. In some cases, however, the toxins prove quite useful to vegetables. For example, a cauliflower-sick soil produces an excellent crop of peas and beans. Crop rotation, judiciously planned, thus eliminates the chances of accumulation of toxin or poison.

For the cultivation of certain vegetables like celery, a deeply dug-up trench is needed. A shallow-rooting vegetable can be grown well on the same land after harvesting celery and without spending much labour on further digging and excavating.

Land remaining under shallow-rooted crops, year after year, impoverishes the soil in one kind of nutrient and hardly gives the soil a chance to become deeply cultivated. Consequently, it will require the application of fertilizers in larger quantities in order to grow shallow-rooted types of vegetables on the same patch. This causes damage to the texture of the soil and makes its lower strata a solid block.

The chances of occurrence of diseases or attacks by insects and pests are more if one type of vegetable is grown on the same plot, year after year.

Crop rotation aims at the intelligent and scientific handling of the soil by making full use of the food material already present in the soil. Simultaneously the food requirements are supplemented by methodical and systematic manurial treatment. This process avoids waste and extravagance and yields quality produce at a comparatively lower cost.

Groups of Crops

For crop rotation purposes, vegetables can be grouped as follows, with greens being accommodated under one or the other heads.

(1) Deep-rooted vegetables
(2) Shallow-rooted vegetables
(3) Beans and Peas
(4) Potatoes

Vegetables can also be grouped in the following manner

(1) Greens including Cabbage, Cauliflower, Brussel's Sprout etc.
(2) Roots including Turnip, Carrot Beetroot, Parsnip, Swedes, Salsify.
(3) Peas and Beans comprising Broad Beans, French Beans and Peas.
(4) Bulbs including Potatoes, Leeks, Onions, Shallow Arthichokes.

A three-to-four-year formula can be evolved for their cultivation. For a three-year rotation formula in vegetable cropping, the vegetables may be divided into three groups, namely (1) the cabbage family including cauliflowers, brussel's sprout and greens, (2) potatoes and (3) root crops. Amalgamate the other vegetables with one or the other of the aforesaid three main groups.

For rotating crops this way, the vegetable patch should be divided into three parts and the rotation scheme can be implemented in the following manner:

	First year	2nd year	3rd Year
Plot I • •	Potatoes	Roots	Cabbage group
Plot II • •	Roots	Cabbage group	Potatoes
Plot III • •	Cabbage group	Potatoes	Roots

(Note: In the root crops, the deep-rooting vegetables can be alternated with shallow-rooted types and celery, leeks, etc. could be grown on the ridges or in the lines separating the different portions.)

A four-year rotational formula is preferable to the three-year scheme. Here are two charts for guidance of the gardener.

CROP ROTATION CHARTS

(4 year programme)

Chart No. I

I Plot Pulses & Surface crops Leek, Celery etc.	II Plot Root crops	I Year
III Plot Greens (Bulbs & Tubers)	IV Plot Potatoes	
I Plot Potatoes (Bulbs & Tubers)	II Plot Pulses, Surface crops	II Year
III Plot Root crops	IV Plot Greens	
I Plot Greens	II Plot Potatoes (Bulbs & Tubers)	III Year
III Plot Pulses, Surface crops	IV Plot Root crops	
I Plot Root crops	II Plot Greens	IV Year
III Plot Potatoes (Bulbs & Tubers)	IV Plot Pulses, Surface crops	

Chart No. II

	First Year	Second Year	Third Year	Fourth Year
I Plot	Potatoes (Bulbs, Tubers)	Beans, Peas & Pulses	Cabbage group & Greens	Root crops
II Plot	Beans, Peas & Pulses	Cabbage, group & Greens	Root crops	Potatoes (Bulbs & Tubers)
III Plot	Cabbage group & Greens	Root crops & Greens	Potatoes (Bulbs	Beans, Peas & Pulses
IV Plot	Root crops	Potatoes (Bulbs & Tubers)	Beans, Peas & Pulses	Cabbage group & Greens

For four-year crop rotation purposes tubers and bulbs may be combined to form one group, namely bulbs and surface crops (leaf stalk or stem crop) and herbs can be combined with pulses in the same plot. Root crops will stay distinct as a group and so also the greens. In this formula, leafy vegetables like spinach, mint, coriander, lettuce and salad crops can be grown as catch crops on the ridges or lines separating the four portions from one another or can be cultivated as inter-crops. They will not interfere with the main crops or affect their production in any way.

XII

Winter and Spring Vegetables

THE FOLLOWING ARE some of the important Winter and Spring vegetables :

- Celery
- Beans
  - (1) French Beans (*Farash Beans*)
  - (2) Broad Beans (*Sem*)
- Beetroot
- Carrot
- Cauliflower
- Cabbage
- Sabz Gobhi (*Broccoli*)
- Knol Rabi (*Knol Khol*)
- Brussel's Sprouts
- Lettuce
- Onion
- Peas
- Potatoes
- Radish
- Turnip

"Celery" Apium Greveolens: "Salahri": Umbelliferae

According to Louise Bush Brown and James Bush Brown, authors of "America's Garden Book," the cultivation of celery as a food crop started after the 16th century. In celery, the fleshy leaf stalks are used after blanching, or as salad in raw form or for the preparation of soup or for flavouring. Europeans introduced its cultivation as a vegetable in this country. The green colour of the leaves is bleached as the leaves taste bitter when green.

In the plains of North India, celery is cultivated as an annual and in the hills as a biennial. The plants in the hills produce leafy stalks in the first year and seeds in the second year. A cooler climate being more favourable, celery is cultivated to perfection in the hills.

Cultivation of two types of celery i.e. the red and the white is in vogue. The red variety produces more compact, firmer and denser leaf stalks than the white, though with due care in cultivation and with the selection of better seeds, the white variety too produces good quality material. Seeds are sown broadcast at the rate 225 to 337 grams to 36.5 square metres after mixing them with sand. Seeds are sown in seed beds from August to October in the plains and in February, March and April in the hills. About 28 grams of seeds will produce about 5000 plants. Celery seeds usually take a long time to germinate and the seedlings take time in producing fleshy leaf stalks. Normally, seeds take four to six weeks to germinate but under ideal favourable conditions they may do so in 12-14 days. A temperature of 60 to 75° F is good for sowing. Seeds will germinate in a month to a month and a half in Bangalore, in 10-14 days in the Punjab and, still earlier, in the hills. In four to five weeks seedlings will be fit for transplanting at site.

A light soil is good for sowing. In the initial stages the seedlings in the seed beds should be kept 5 cms. apart. They should be transplanted at the permanent sites when 7.5 to 10 cm tall in Calcutta or 10 to 15 cms tall in Bangalore. The principle followed in transplanting seedlings is that it is done when the crowns are about 6 mm. in diameter. Seedlings should be transplanted 15-20 cms. apart in May in the hills and in January in the plains of the Punjab and 25-30 cms. apart in Bangalore and in the plains of South India. The planting distance varies from 30 to 90 cms., from row to row.

Soil

A richly-manured and well drained soil, retentive of moisture, is most suitable. Conditions of dryness at the roots lead to seed formation, prematurely, thus resulting in a poor crop. In the Punjab sandy loam, ploughed five or six times, yields the best results.

Celery relishes a deep soil—slightly acidic soil being better than alkaline. Trenches should be dug up 40 to 45 cms deep and 45 cms. wide. They may be spaced 60 to 75 cms. apart. The excavated soil should be piled on either side of the dug-up trenches in equal quantities. Refilling should be done in the following manner. A 15 cm layer of well-decomposed compost should be spread at the bottom of the trench and made firm. Over it should be spread a 12.5 cm thick layer of pulverised and friable soil. The surplus soil lying on the two sides of the trench should be dressed and used for the sowing of catch crops like Lettuce, Spinach, Coriander, Mentha, Radish and Carrot.

Firminger suggests another method. Holes may be dug up 30 cms. deep; 22.5 cms. in diameter and 15 cms. apart. These should be filled with rich manure, in the ratio of 2 parts of well-rotted cowdung and one part of earth leaving 7.5 cms. open at the top. Seedlings may be planted in each hole.

Papaya Fruit

Papaya Tree

Lemon

Lemon Tree

Grapefruit

Grapefruit Tree

Dahlia

Pompom

Raw Bananas on a Tree

Planting in the middle of the trench is done in South India. Lateral shoots are removed. Regular irrigation once a week in the plains during the warm Season and once in two weeks in the hills are necessary. Liquid manure may be applied once in 10-14 days during the growing period.

Blanching

Blanching seeks to bleach the leaves by earthing up the plant about two weeks before the crop is harvested.

Different methods of blanching are in vogue:

Method 1

Cut a 45 cm long bamboo stick into two. Make the ends pointed and insert them into the soil opposite each other, around the plant and close to it. Earthing-up is then done. Some use earthenware pipes instead of bamboo sticks for this purpose. Waterproof bleaching paper and card-board collars are used for blanching purposes.

Method 2

Insert 45 cm long stakes 15-25 cms in the ground. Boards 20 cm wide should be placed on both sides of the plant as close as possible but without injuring the plant. The distance between the boards at the top should be about 7.5 to 10 cms. Boards be kept in an upright position by means of stakes. The leaves should remain in a vertical position.

Blanching in South-India

When the plants are 30 cms. high, the outer leaves which are usually short are removed and the remaining leaves and stem are wrapped with brown paper so as to avoid rot. Earth up the bases of leafy stalks to a height of 10 to 12.5 cms. Earthing up is done weekly and up to the stage that their tops are justisible. Earthing up is done in a manner that the soil should slope towards the middle of the leaves.

The root system in the celery plant is shallow and fibrous. Consequently, deep cultivation is not required. Shallow cultivation up to 2.5 cms is sufficient. This will remove weeds and conserve moisture. The crop (leafy stalks) will be ready for harvesting, with a sickle, from November to December in the hills of the Punjab and in May in the plains.

"French" "Kidney Beans": "Farash Beans": Phaseolus Vulgaris: Leguminosae

French Beans are of two kinds-the climbing types and the dwarf ones. Both produce a prolific crop and have green and wax podded varieties. The wax podded varieties, which are light yellow or cream skinned, have a better flavour. The Dutch type amongst the climbing French Beans, producing ivory-like seeds, is the best.

French Beans prefer a light soil and are able to stand drought well. The land should be dug up at least 30 cms deep, treated with a fair quantity of farmyard manure or well-decomposed compost. The application of 84 grams fish manure containing 10% of potash, and 112.5 grams of wood ash per 8.4 square metres at the time of preparing the soil is helpful.

If, due to bad weather, the plants do not flourish well after they have started growing, the application of dried blood at the rate of 28.0 grams to a length of 0.9 metres, and copious watering simultaneously, will tone up the plants. The application of 112.5 to 168.7 grams of lime to 0.8 square metres, the exact dose varying according to the acidity present in the soil, is helpful. Lime is to be applied at the surface after the application of fertilizers.

In the green podded varieties, "Golden Dax" and "Low's Champion", production increases somewhat, and in the Pole Horticultural Bean, the increase in production is slight. Lima Bean is not at all benefitted by the application of lime.

In both beans and peas it is advisable to supply a moderate quantity of immediately-available nitrogen so that the plants can take root. Later, when established, they can fix atmospheric nitrogen.

Seeds should be sown from September to October in the plains and from March to July in the hills and in early rains in the South in order to secure the best crop.

For the climbing types, the seeds are to be sown about 15 cms apart in double rows spaced about 30 cms. apart. The distance from one pair of rows to another should be kept a metre and a half. Later, the seedlings should be thinned so as to be kept at a distance of 30 cms. from one another. About two-metre-high supports may be provided. Bushy stakes or wire and poles can be used for the purpose. The crop is ready in two to two months and a half.

Dwarf French Beans do better in a semi-shady position. Directly under the sun the plants do not put forth a good growth and the leaves are eaten by insects also. Seeds should be sown 7.5 to 10 cms apart, 2.5 cms deep in rows to be spaced 45 cms apart. Four hundred and fifty grams of seed will be sufficient for a bed 30.50 metres long. Seeds will germinate in three to six days and plants will produce the vegetable in one month and a half to two months. Earth-up the stems when they are 15 cms. high and provide supports to the plants. The crop is of a short duration, giving three to four crossings before the plant completes fruiting. Consequently, by making successive sowings, at intervals of a week each, during sowing time, a continuous supply of beans is ensured in the season.

The pods in the climbing and the dwarf types should be picked while tender.

Bean Varieties

Amongst Dwarf Beans, *Stringless Refugee* is ideal for bungalow, kitchen or home gardens. Other promising strains are—The Prince, The Wonder, Black Wonder, Green Pod Tender, Green Golden Wax and Superlative which do extremely well in dry weather and have a long fruiting period. In the climbing types, Princess of Wales, Tender and True, Golden Cluster, Wax and Kentucky are the best.

"Broad Beans" ("Sem": "Bakla Sem": Vicia Faba Leguminosae)

Growing well on light as well as heavy soils, *Broad Beans* are divided into two types, namely, Long-podded and the Windsor type or the Broad-podded varieties. These varieties are grown from September to November in the plains of North India, Rajasthan, Bangalore, Pune and East India; from October to December in the South Indian Plains and Bombay; from May to June and October to November in the hills of North India and from January-February to March-April and September-October to November in the hills of South India.

Broad-podded types do extremely well in the hills though both the types are grown with success at lower elevations.

A previously-manured soil yields a better crop. The seeds should be soaked for 12 hours in lukewarm water, before sowing, in order to stimulate quicker germination. They should be placed about 5 cms. deep and 7.5 cms apart (later on, to be thinned so as to be kept 15 cms. apart) in double rows to be spaced 30 cms. apart. The distance from one set of double rows to another should be 75 cms to one metre. Sowing should be in a staggered fashion. Sowing can be done 15 cms. apart in pits which should be spaced 0.9 metres apart, in rows to be located 1.2 metres from one another. However, sowing is done in nursery beds also, so as to fill the gaps with seedlings, when the latter are 7.5 to 10 cms high.

Four hundred and fifty grams of seeds are sufficient for planting a 17-metre long piece of land in the double row system. When the plant attains a height of about 30 cms., it should be earthed up and provided with a suitable support. Remove the basal and side growths so as to keep the plant in a one-stemmed form. Flowering takes place after about two months. When the plant is in full bloom, the topmost 2.5 cm portion of the blossoming branches should be pinched out so as to induce an early formation of pods. The application of 84 grams of fish manure with 10% of potash per 0.8 square metre, 140.6 grams of meant and bone meal to 0.8 square metre and a bucketful of sedge peat are immensely helpful.

Hoeing is desirable and spraying the plants with debris or soap solution with tobacco decoction, in case they are infested with black aphids, is necessary.

Pods should be picked regularly and while still tender. Regular picking is essential for securing a heavy crop.

After the produce is harvested the plants should be cut down to the ground level. The roots should be allowed to remain in the ground and must be dug in.

Dwarf Beans are sown 15 cms. apart in double rows spaced at a distance of 23 to 30 cms from one another. The distance from one set of double rows to another may be 60 cms. Seeds should be planted from September to December in the North Indian plains and Rajasthan; in January and from May to December in a Bangalore and Pune; from January to April and August to November in the South India hills and from March to June in the hills of North India.

"Beetroot"—Beta Vulgaris—Chenopodiaceae

Although tolerant of slight acidity in the soil, Beetroot relishes a deep light loam with some alkalinity or salinity in it. Farmyard manure or compost should be applied at the rate of one barrow load to 8.3 square metres.

Seeds should be sown at site at the rate of 5.6 kg. of seeds to 0.4 hectare of land, 3 cms deep on 15 cm high ridges. These ridges should be located 15 cms apart. Seed sowing can be done from August to November in the plains of North, South East India and Bombay; from May to June and September to October in the hills of North India; from February to April and September to November in the hill of South India and from June to July and September to October-November in a climate like that of Bangalore. Watering may be done once in three-four days till germination starts. On attaining a height of about 5 cms seedlings may be thinned out, an optimum distance of 7.5 cms to 10 cms being kept.

In light soils, an application of salt at the rate of 56 grams to 8 square metres of land is very beneficial when the plants are half grown.

Beetroots will be ready for lifting within 3-4 months of the sowing of seeds. There are round-rooted and long-rooted types, the former being better.

"Carrot" Dancus Carota: Umbelliferae

Carrots *(Gajar)* are of two types. The long-rooted variety has the taste of a real carrot. The other variety takes the form of a blunt spindle. The latter is more easily cultivated, is tender, mildly-flavoured and penetrates deep into the soil.

The promising varieties are Oxheart, Early Scarlet Horn, lmperator, Chantenay Nantes and Danvers Half Long.

A pebbled soil is not suitable. Before sowing, the soil should be dug up at least 30 cms deep and cleared of all stones. Farmyard manure should be administered at the rate of 10.16 tonnes per 0.4 hectares. Sow the seeds in a broadcast manner or in drills at the rate of 1.3 to 2.7 kg. per hectare. If sown in drills, the distance between the drill points should be 30 to 45 cms.

Seeds are to be sown at site, 1.2 cms deep from August to November-December in the plains of North India, Rajasthan, Maharashtra and South and

East Indian plains; from February to April and September to October in the hills of North India; from January to March-April and September to October-November in the South Indian hills and from May to November-December in a climate like that of Bangalore. The seeds will germinate in about 15 to 20 days. As the seedlings grow, the supply of water should be liberal to enable the roots to penetrate into the earth. The base of each plant should be covered with soil. The sown area should be kept clean of weeds. The application of muriate of potash at the rate of 160 kgs. per 0.4 hectare brings heavier yields.

The crop will be available from December to March.

"Cauliflower" Brassica Oleracea Var Botrytis Cruciferae

Cauliflowers are of many varieties. There are the early, medium and late varieties all ideally suited to higher elevations. For lower elevations, the early varieties are the best. Never delay the planting of early varieties or hasten the sowing of late varieties. Sowing of the varieties at their proper time is the key to success with the early and late varieties of cauliflowers.

For North India, the early varieties ideal for planting between August and mid-September are Early Patna, Katki, Aghani, Kunwari or Kuari and for late plantings, from mid-September to mid-November, Giant Snowball and China Pearl are the best. For South India, for planting to be done between October and December, the ideal varieties are Danish Giant, Snowball and Pomoeol.

Sowing of seed can commence from the middle of August and continue up to November in the plains of South India, Bombay, Bangalore and Pune; from June to October in the plains of North, India, Rajasthan and East Indian plains; from November to March in the hills of South India and from March to May and September to October in the hills of North India. Seedlings should be planted on either side of 60 cms wide raised beds located at distances of 90 cms from one another. A heavily-manured, rich loamy soil, capable of retaining moisture, with ammonium sulphate applied as a top dressing, is best for the cultivation of this vegetable.

Normally, for planting 0.4 hectare of land with cauliflowers, 112.5 to 225 grams of seeds are enough for the preparation of seedlings. In early sowings, the casualties among seedlings are high. Consequently, seeds are required to be sown in greater quantity.

Watering is to be done once a week in the initial stages after transplanting and once in two weeks, afterwards. A month after transplanting, the cauliflowers should be earthed up. Hoeing between the plants, copious watering during dry spells and bending the inner leaves over the flowers to save them from opening up or going yellow or brown if the weather gets warm, yields better results. Cauliflowers mature within three to four months of the sowing of seeds. Cauliflowers should be picked on their attaining a good size and maturity.

"Cabbage" Brassica Oleracea: Cruciferae

Seeds are sown from August to November in the plains of East India; from August to January in a climate like that of Bangalore and from September to November in the plains of North India and Rajasthan. Seeds may be sown from August to October in North India and in October in the South. Two hundred and twenty five grams of seed will be sufficient for 0.4 hectare of land.

Four to six-week-old vigorous seedlings should be transplanted at the required site. Seedling plantation should be 37.5 cms apart in rows located 45 cms from one another, for small varieties and 45 cms apart in rows 60 cms from one another, for the large types. Being a heavy feeder, application of farmyard manure, at the rate of 20 tonnes per 0.4 hectare is necessary.

The varieties recommended for planting are *Pride of India, Golden Acre, Early & Late Drum-head. Flat Dutch* and *Glory* of Enkhuizen Copenhagen Market.

"Sabz Gobhi" : "Broccoli"-Brassica Oleracea Var. Botrytis or Italica : Cruciterae

Sowing of seeds is done from September to November-December in the plains of North India, Rajasthan, Maharashtra and. South East India; from February to April in the hills of South India and from March to April-May in the hills of North India.

Four types of Broccoli could find a place in a vegetable garden. One bearing white heads is grown late from October-November in the plains so as to produce the heads in spring. This is sometimes called the late variety of cauliflower. The second type produces mauve or purple sprouts and the third type bears a number of white sprouts with an agreeable flavour. In the green type the central head is green and resembles the cauliflower. After it is harvested, the side shoots produce small green heads thus making the produce available for many weeks.

"Knol Rabi" "Knol Khol"—Erassica Oleracea Var. Gongylodes Ganlorapa : Cruciterae

Seeds are to be sown from August to November in the plains, from February to May in a climate like that of Bangalore and from April-May and September-October in the hills of North India and from February to April in the hills of South India. Seedlings should be transplanted 22.5 cms apart in rows located 45 cms apart from one another. One and one-third kg. of seeds will yield seedlings sufficient to plant an area of 0.4 hectare. The crop is ideal for picking when the stems are 6-7 cms. in diameter.

"Guncha Gobhi" "Brussel's Sprouts"-Brassica Oleracea Var. Gemeni Fera (Cruciferae)

The soil preparation is similar to that of cabbage. Manure required is a barrow load for every 6.60 square metres. Seeds of Brussel's sprouts are to be sown from

September to October in the plains of East India; from August to October in the plains of North India and Rajasthan and from August to November in a climate like that of Bangalore. The sowing season is from February to April and September to December in the hills of South India and from March to May and September to October in the hills of North India for securing two crops. About three hundred and thirty eight grams of seeds will yield seedlings sufficient to plant 0.4 hectare of land. Seedlings 15 cms high should be transplanted 60 cms, apart in rows located 75 cms, from one another.

Watering should be done after a week and plants should be earthed up after three weeks. The roots of Brussel's Sprouts go deep. Hence deep cultivation is advisable in the initial stages.

The application of fish manure with 5% potash content at the rate of 84.8 grams per 0.8 square metre and soot at 112.5 grams per 3.6. metre-length is helpful in case the sprouts are not growing satisfactorily. The heads of Brussei's Sprouts will be ready for picking in a period of about three months.

"Onion" Azzium Cepa: Liliaceae

The onion popularly known as "Piaz" is eaten raw as well as in a cooked form. Onions relish a deep, rich sandy loam, which should be well drained and simultaneously be able to retain moisture. A sightly alkalinic soil is good for onion cultivation. Trenching should be done to a depth of at least 30 cms and farmyard manure should be applied at the rate of 24 cartloads to 0.4 hectare of land covering all but the top spit of 15 cms. In case of shortage of farmyard manure, this may be supplemented by an application of superphosphate and ammonum sulphate each at the rate of 37 kg. per 0.4 hectare of land. The soil should be made firm at the time of sowing of seeds.

Seeds are sown either broadcast or through drills from the middle of October to the middle of November in the plains and from early March to end of May in the hills. In the drill system, seeds are sown 5 to 7.5 cms. apart in rows located about 30 cms apart. In both systems of sowing, the seeds are covered with a very light covering of fully-rotted and finely-sieved compost. The soil in the seed beds is kept soaked by sprinkling water with a fine hose every third or fourth day.

For raising a nursery, 3.7 kg. of seeds sown in about 50 Square metres of land, will produce seedlings sufficient for planting an area of 0.4. hectare. Seedlings will be ready for transplanting at the required sites in 8 to 10 weeks. They may be spaced 10 cms apart in rows located 22.5 to 30 cms from one another. The application of poultry manure at the rate of 84.0 grams to every 0.8 square metre of land before planting, is beneficial.

Watering should be copious after germination of seeds and once in two weeks thereafter. Hoeing should be done twice or thrice during the growing season and slightly away from the base of the plants. This will enable the edible bulbs to develop properly and also do away with the weeds.

Application of nitrogen in the form of nitrates, ammonium salts and in organic form is advantageous. Potash should also be applied liberally. Superphosphate is very helpful in accelerating maturation and ripening. Too high a percentage of nitrogen and its application in a dose disproportionate to potash will prolong the growth period. The onion will develop thick necks without maturing or ripening properly.

Onions do not flourish well on a intensely acidic soil since such soil is deficient in carbonate of lime. Lime deficiency is one of the root causes of the failure to develop the onion crop. Wood ash at the rate of 225 grams to 0.8 square metre area and dried blood, a tonic to the onion, at the rate of 28 grams per one metre length, applied in the growing season, are immensely helpful.

When the bulbs start maturing, watering should be done only sparingly. Watering should be stopped completely when the tops fall down. Onions will be fit for lifting in May.

For seed production, sow in October and November selected small-sized disease-free dry and healthy bulbs. The bulbs may be planted 30 cms apart in rows 60 cms away from one another. Large onions can be cut into two-three pieces. Each piece possessing a root zone can also be planted likewise. Seeds can be collected by April-May. Small onions of the previous year's crop, if sown from September to October, yield green onions fit for picking in almost one month. Onions can be grown on the same soil for a number of years.

Red-skinned onions being pungent are less popular than the white-skinned variety although the former are hardier and possess a greater lasting and storing capacity.

"Peas" "Mutter" Pisum Sativum (Leguminosae)

"Smooth-skinned" and "Wrinkled" are the popular types in Peas. In the formers the yield is greater. It also fruits earlier and is hardier. The latter type is sweeter and better flavoured.

For peas, the soil should be dug up to a depth of at least 30 cms. Well-decomposed farmyard manure should be added at the rate 4.5 kg per 0.8 square metre. The application of bonemeal at the rate of 112.5 grams per 0.8 square metre, of potash at the rate of 140.5 grams to 0.8 square metre and of wood ash should also be made.

Seeds of peas are likely to be eaten by insects and birds. It is, therefore, safer to mix them well with sweet oil and, thereafter, with "red lead" so as to allow them to take on a covering of this poisonous powder. Special watch is needed over the area where seeds have been sown till the seedlings grow about 15 cms high. Sow seeds directly at site at the rate of 27 kgs to 0.4 hectare.

Seeds should be sown from September to November in the plains and at lower elevations, from July to September in Bangalore; from March to May in the hills of North India and from October to November and February to April in the hills of South India.

A light sandy loan as well as a heavy clayey soil are suitable for peas. A deep rich friable loam is however most suitable. Seeds are sown 2.5 to 3.7 cms apart in a double pair of rows 15 cms apart. These rows are to be spaced 37.5 to 45 cms apart for dwarf varieties and 60 cms to 75 cms for tall varieties. Watering should be done immediately thereafter. Application of 15-20 tonnes of farmyard manure to 0.4 hectare of land in addition to the application of a top dressing of a fertilizer will yield the best results. Staking of seedlings when they are about 7.5 cms high is necessary in tall varieties. Bushes may be stuck in order to enable the growing peas to train on them. This will facilitate harvesting.

Watering should be limited to once a week in the initial stages and increased to twice a week with pod formation. Reduce watering when the pods develop fully.

Dwarf varieties fruit in three months and tall varieties in four months. The "Smooth-skinned" pods should be harvested when they are nearly half full, as on growing larger they loose their flavour. The "Wrinkled" variety can be picked when they become completely full. Harvesting should be done only in the mornings and evenings. The produce should be kept in a cool place till required for use in the kitchen.

The roots of peas bear nodules which take nitrogen from the air and store it. When the plants are cleared after harvesting these nodules, if left behind, will enrich the soil with nitrogen.

The varieties recommended for planting are Lucknow Dwarf and PID (for early), American Wonder, Telephone, Thomson Laxton, Marrow Fat, P-8, P-35, T-163, T-19 and Early Badger (for main and late crops).

"Potato" "Alu"—Solanum Tuberosum : Solanaceae

Potatoes do extremely well in a deep, well-drained and medium soil. A clayey or too sandy soil is not suitable. An open sunny location is best for this plant. A location under a tree and a "stifling" atmosphere leads to the development of soft foliage inviting an attack of Potato Blight.

Ridges made for planting potatoes should be 10 cms high and should run North to South so as to get an equal amount of sunlight on either side. The tubers should be planted from October to November in the plains

7.5 to 10 cms. deep and 37 cms apart in rows 60 cms apart. The crop will be ready by February. In Bangalore two crops are obtained by sowing once in May-June and a second time in October-November. In the hills, tubers are planted in February for the main crop and from July-August for the second crop.

Tubers should be disease and virus free. Hence they should be purchased from a very reliable source otherwise all the labour is likely to be wasted. A tuber ideal for sowing should be of the size of an egg weighing about 56 to 76 grams. If the tubers are very large these may be cut into pieces of the sizes, mentioned above. Each cut piece should have at least two eyes. Tubers should be cut into pieces just before the actual planting.

The cultivation of potatoes in the same plot, year after year, should be avoided. Potato seed should be planted in ridges about 22.5 cms high raised with loose soil. Watering should be done sparingly, in the initial stages, and copiously when the stems have grown about 15 cms high. Too much of watering is likely to rot the tubers. Hoeing should be done between the rows. Leaves turning yellow is an indication that the tubers are reaching maturity. Watering should then be stopped. When the stems die completely the crop can be dug out.

The application of potash manure is necessary for the development and growth of tubers. An ideal fertilizer will be a mixture of super-phosphate (three parts), potassium sulphate (one part) and ammonium sulphate (one part) applied at the rate of 450 grams to a 36.5-metre length. In warmer regions, the use of organic manures is most effective. Potatoes need more of nitrogen. Hence about 18 to 40 kgs of nitrogen per 0.4 hectare should be applied.

The dosage of muriate of potash to be applied varies from 67 to 180 kgs per 0.4 hectare, the actual quantity depending on the texture and pH value of the soil. In certain cases a lower dosage will do. It is necessary that potatoes should receive a high content of soluble and available phosphoric acid. Seed tubers of potatoes, which are richer in nitrogen, produce a high yield of crop. Early dug up potatoes after the crop is ready, are richer in nitrogen than fully-matured ones.

"Radish" "Mooli"—Raphanus Sativus : (Cruciferae)

Two indigenous varieties, namely Long White and Long Rose, can be sown in the plains from August-September to January-February. Some imported varieties namely White Icicle, Scarlet Globe and French Breakfast are ideal for sowing from September to March. In the hills of North India sowings are done from March to May and September to October-November; in the hills of South India from January-February to April; in Maharashtra and Pune from August-September to December-January and from June to October in a climate like that of Bangalore.

The soil should be dug up deep. Wood-ash should be added to it to make it lighter. Heavy soil produces coarse roots and such a soil should be avoided.

Seeds should be sown to a depth of 2.5 cms preferably in drills at the rate of 1.3 to 1.8 kg per 0.4 hectare. The distance between the drill points should be 30 to 37.5 cms. Seeds will germinate in four to six days. Sowings at intervals of 15 to 20 days will give a regular supply of tender roots. The seedlings should be kept 15 to 22.5 cms apart. Watering should be liberal during the growth period. The soil should be hoed regularly.

The vegetable will be available in two months.

"Turnip" "Shalgam" Brassica Rapa : Cruciferae

Seeds should be sown broadcast or in drills preferably on ridges, 45 cms apart and 22.5 cms high. Sowing can be done 1.25 cms deep.

Sowing should be done from September to November in the plains of North India, Rajasthan, Maharashtra and South East India; from March to May and September to October in the hills of North India; from February to March and September to November in the hills of South India and from June to July in a climate like that of Bangalore. The seed rate should be 900 gms to 1.35 kg. per 0.4 hectare.

The soil should be light, not recently manured and well dug up. If the broadcast method is used, it is advisable to mix the seeds with four times its bulk of dry sand and then disperse the seeds evenly on the soil surface. If sown in drills, the distance between the drilling points should be 30 to 45 cms. Seedings should be thinned out so as to keep them 22.5 cms apart. Sowing is to be done on site.

The supply of vegetables will last from October to March. The yield is estimated at about 74.5 quintals of fresh root or 1.9 to 2.25 quintals of seed per 0.4 hectare.

For an early crop 4-Red and 4-White are the promising indigenous varieties. Seeds are to be sown up to September. Purple Top, White Globe, and Golden Ball are the imported varieties of merit, the seeds of which should be sown from October to December.

XIII

Vegetables for Summer and Rainy Seasons

GIVEN BELOW ARE some of the more popular vegetables that can be raised during the summer and rainy seasons.

"Bhindee" "Lady's Finger" Hibiscusesculentus Malvaceae

The seeds of this plant are sown at the rate of 30 kilos to a hectare on ridges in rows spaced 45 cms apart. Seed sowing is done from February to April in order to obtain an early crop and in July for a late crop, in the plains of North India. Seed sowing is done from April to July in the North Indian hills; from April to July and September to November in South Indian plains and in Calcutta and Maharashtra regions; from March to April in the South Indian hills and more or less throughout the year in places like Bangalore and Pune.

A well-manured soil is necessary. Three to four ploughings, aiming at deep digging, should be given so as to make the soil friable. Apart from dressing, the seeds, being hard should be soaked for 24 hours in water before sowing. The soil should be moist at the time of sowing. Well-rotted compost and fertilizers are necessary for a good crop. The rate of the application should be 25-30 cartloads of cowdung manure per hectare at the time of ploughing and a mixture of ammonium sulphate (250 kilos), superphosphate (375 kilos) and muriate of potash (75 kilos) per hectare should also be applied.

The seedlings should be kept 23 cms apart for varieties like "Pusa Makhmali". "Bhindee No. 29". "Perkins Hari" and "Pusa Sawnee". For other varieties the distance from plant to plant can vary from 37.5 cms to 45 cms in rows about a metre apart. Watering after four or five days in summer and once in a week or 10 days in winter is necessary. Successive sowings can be done, at an interval of a week in order to obtain a regular supply of pods. The crop is ready in about 70 to 80 days. The pods for cooking purposes should be picked while they are tender and devoid of fibre. The pods are eaten in cooked form and are used for thickening soup.

"Karela". Bitter Gourd": Momordica Charantia: Cucurbitaceae

The seeds of this plant are sown from March to April to secure an early crop and from June to July for a late crop. Three or four seeds are sown about 15 cms apart in pits at a distance of about one metre from each other. The rows are spaced a metre and a half apart from one another. After the growth starts, 2-3 strong plants are retained and the others are pulled out. "Karela" requires heavy manuring.

The plant is trailing in habit. Consequently it is beneficial to train the plants on supports so as to get better fruit or spread straw underneath the fruiting branches so that the vegetable does not rot as a result of remaining constantly in touch with moisture.

"Lauki". "Bottle Gourd": Lagenaria Vulgaris : Cucurbitaceae

The seeds of "Bottle Gourd" should be sown from February to June and from May to July in the plains of North India in order to have the crop in the summer and in the rainy season. The sowing may be done from February to August in East India, and in the hills from April to May.

A richly-manured sandy loam is necessary. Three or four seeds should be planted in pits located a metre apart, in rows spaced a distance of a metre and a half from one another. After the start of growth only the strongest plant should be retained. It should be trained on a support in the bower system. Watering twice a week during summer is necessary. The round variety produces an early crop. The long variety is late in fruiting.

"Ghia Tori" ("Sponge Gourd" or "Luffa": Luffa Acutingula Cucurbitaceae)

This plant is grown from seed from February to March so as to get the vegetable ready for use from August to October. A second sowing can be done from June to July so as to have the vegetable from September to December.

Another variety, popularly known as *Turai* or the Ribbed Gourd, is sown from June to July.

In both cases, seeds are sown 15 cms apart in pits. The distance between pits should be one metre and between rows one and a half metres. The plant can be trained in the form of a bower or as a screen, along supports.

"Tinda" ("Tinda Gourd": Citrullus Vulgaris-Var : Cucurbitaceae) Fistulosus

The seeds of this plant are sown from February to April and from June to July in the North Indian plains for raising two crops in a year. In Bangalore, sowings are done from February to March and in Calcutta from mid-January to the end of March.

A sandy or silty loam is suitable. Well decomposed farm manure should be applied at the rate of 16 to 18 cartloads per 0.4 hectare. Seeds are to be sown 1.25 cms deep and at the rate of 1.8 kg par 0.4 hectare. Ridges are prepared on raised beds 1.2 to 1.4 metres apart. Three seeds are to be planted at one point. This is repeated every 1.2 metres. The seeds germinate within three months. Watering is done immediately after sowing. A second watering is done after 4 to 5 days and, thereafter, watering once in 10-12 days is sufficient. At each point, only the strongest seedling is retained. The crop will be ready in about three months. Pale-green and green are the popular varieties.

"Kheera" ("Cucumber": Cucumis Sativus Cucurbitaceae)

The seeds of this plant can be sown in North India and Rajasthan from February to March-April and September to November; in Maharashtra and Tamilnadu from February to April and September to December; in the hills of North India from May to June; in the hills of South India from March to May; in Bangalore and Pune from April to August and November to February and in the East Indian region from February to July and September to November.

A moist soil rich in organic matter and well-drained is best for cucumbers. Cucumbers need more of lime. In the plains, seeds should never be allowed to come in close contact with any fertilizer or soil containing a large quantity of fertilizers. In the hills, in case fertilizer has been added to the soil, it is advisable to ensure that the fertilizer is very well worked into the soil and, after that, it is covered with fresh soil before seed sowing. The soil should be trenched to a depth of 60 cms, a month before sowing.

Sowing

Seeds may be sown at the rate of 1.35 to 1.8 kgs to 0.4 hectare, at a distance of about 15 cms from each other in rows 1.5 to 1.8 metres apart. Three to five seeds can also be sown 1.25 cms deep and 7.5 cms apart in pits located one metre apart in rows which should be spaced over a metre apart. The pits may be dug up a spade and a half deep within an uniform diameter and refilled after the mixing of manure. The shape of a mound may be given. Below the top 15 cm spit of soil, place a 10 cm layer of well-decomposed vegetable refuse in order to procure the best results. Only two strong plants should be retained after the growth starts and the rest should be discarded.

Cucumbers, being surface rooters, will be immensely benefitted by mulching. Conditions of dryness, however, lead to attacks by red-spider. Stakes may be provided when the plants are 15 cms high. When the cucumber is about 8 cms long application of liquid manure is useful. Watering should be done carefully to avoid exposure of roots. Stem-rot takes place as a result of accumulation of water around the stem. Watering once in three days is essential in the plains and once in four days in the hills. English cucumbers (Ridge and Frame varieties) flourish extremely well in hilly areas where seeds may be sown from March to May.

The cultivation of two kinds of cucumbers is in vogue. The Large type, which attains a length varying from 30 to 45 cms, is green when young. On ripening it gets darker and whitish lines develop from one end to the other. For eating in raw form, the fruit should be picked when only 15 cms long, as after this stage, it gets stiff. It can then only be used cooked. Another variety is the Small Type. This variety is smaller in size, creamy-white in the early stages and develops a rusty colour on the ends, on ripening.

"Sweet Corn" Zea Maize (Gramineae)

If a garden has ample space a small portion could be converted into a "Bhutta Corner", which will produce a rewarding crop in a couple of months.

The land, if it has already been put to agricultural uses, may be ploughed 15 cms deep. Ordinary soil needs to be ploughed at least 45 cms deep. A smooth surface may be given to it. The rate of application of farmyard manure, prior to ploughing, varies from 10 to 15 cartloads to 0.4 hectares.

Seeds are to be sown about 5 cms deep, 20 cms apart, in rows located at a distance of 120 to 150 cms from one another. The soil should be kept moist but not wet till germination starts, when the watering should be copious.

Weeding and proper inter-cultivation, not more than 5 cms deep, application of chemical fertilizers first at sowing time and a second time when the plants are 60 cms to 120 cms high and control of pests will enable the gardener to reap a good produce.

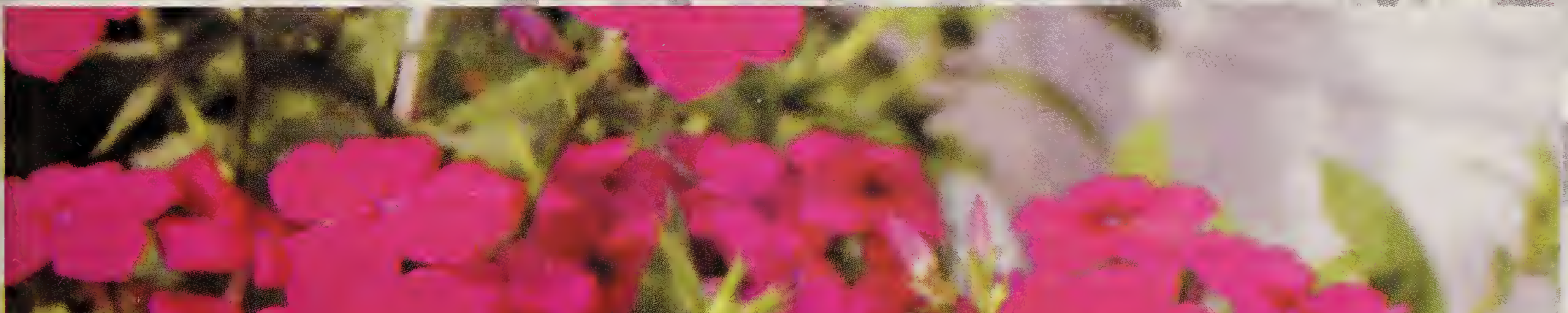
"Kharbooza" ("Musk Melon" Cucumis Melo Cucurbitaceae)

The shape and the size of the Musk Melon varies from variety to variety. Generally, it is 15 to 20 cms in diameter. It is used as a dessert fruit when ripe. It is cooked if unripe. The fruit has a lasting quality.

A rich sandy soil is good. It should be properly manured after trenching. The soil should have a rich content of soluble and readily-available phosphoric acid and potash. This helps in the early maturation of the crop. Fertilizers should not be allowed to come in contact with the seeds.

A dry river bed provides ideal soil composition for "Musk Melon". Holes may be dug about 1.2 metres apart and filled with well-rotted and finely-sifted manure. Seeds should be sown from February to March in the plains of North and East India, Rajasthan, Maharashtra and Tamilnadu and from September to December-January in Bangalore. “Musk Melon” does not flourish in the hills. Three to four seeds should be put in each hole. Retain, at a later stage, only the strongest plant. Seeds are sown at the rate of 3.5 gms per .83 square metres. Watering is desirable every third or fourth day when the plant is young and up to the stage when it attains two-thirds of its full size. Watering should be reduced to the minimum when the fruit is near maturity and is likely to attain its full size. The crop is ready in about three months.

Petunia



Phlox

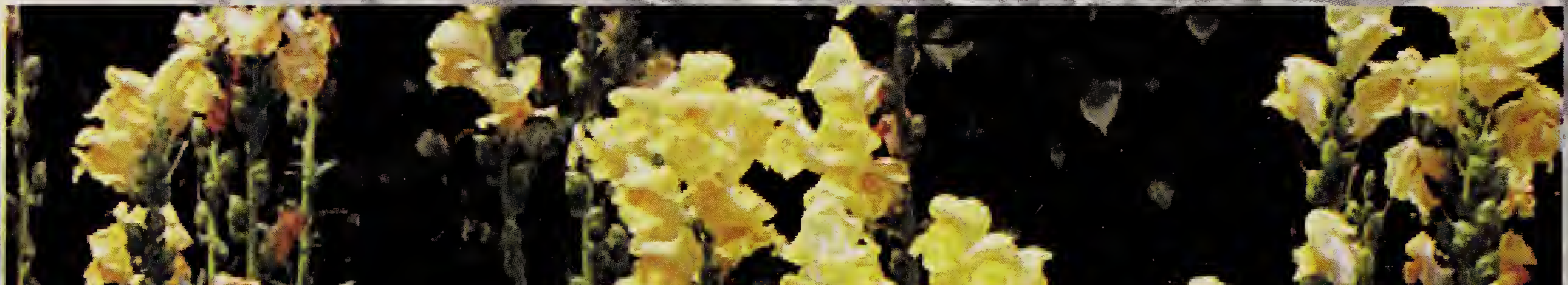
Stock

Gladiolus

Jasminum Sambac

Russelia Juncea

Dombeya



Antirrhinumm

XIV

Vegetables Round the Year

SOME OF THE more important, as well as popular, vegetables which can be grown throughout the year are listed below.

"Brinjal" (Solanum Melongena Solanaceae)

Brinjals grow successfully in regions located at altitudes up to 1300 metres. Seeds can be sown from February to March, May to July and in October in the plains of North India so as to ensure a continuous supply of this vegetable throughout the year. Seeds can be sown from April to August and from October to December in East India. In the South Indian and Western Indian plains the sowing period is from February to March-April and September to November and in the hills of South India from February-March to April-May.

Sow seeds in a nursery and transplant the seedlings twice, after an interval of two-three weeks, before planting at the required sites. The soil should be dug up 45-60 cms deep and farmyard manure must be applied at the rate of 20 cartloads per 0.4 hectare. The seedlings on attaining a height of 10 to 12.5 cms are transplanted at the required sites about 38 cms apart in rows of 40-45 cms from one another.

A heavy soil treated with about 25 cartloads of well-rotted farm-yard manure to every 0.4 hectare will yield good results. Weekly watering in summer and every fortnight in winter will bring forth a good crop.

The Brinjal may be grown as a single-stemmed plant with well-spaced lateral branches. The main stem should be allowed to grow and when it becomes strong enough, the growing point should be pinched out to stimulate the formation of lateral branches. Plants may be earthed up in order to make them firm. After the formation of about half a dozen fruit, the lateral growths can be pinched like the main stem. The process can be repeated so as to develop an ideal framework capable of producing quality produce. The branches may be cut back after the harvesting of the first crop. This is to induce new growth for securing another crop.

Sowing from February to March will produce the vegetable from early June to December. In December, the plants are likely to be damaged by extreme cold or frost and should, therefore, be cut down to 25 to 30 cms from the ground level in regions susceptible to frost. A covering of straw should be provided. Just before spring, the plants will put fourth new shoots and yield throughout the rainy season.

By that time they will be exhausted and should therefore be pulled out. Sowing in July will produce the crop from October to December and sowings in October will yield the vegetable from early April to the rainy season.

The round and the elongated varieties of a deep purple colour are commonly in cultivation. These varieties should be picked when still tender. People who do not have kitchen gardens can grow the Brinjals in 35 cm pots and get a good crop.

"Coriander" "Dhania": Coriandrum Sativum Umbelliferae

"Coriander" leaves are used for flavouring vegetable dishes and chutneys.

The "Dhania" is grown for its seed also which is used for many purposes. A loamy soil is ideal. Seeds are sown at the rate of 9 kg. to 0.4 hectare on site, in rows 30 cms apart. Sowing of seeds is done broadcast. The seed should be rubbed hard before sowing so as to open it up for germination. Seeds will germinate in seven to ten days' time and plants should be kept at a distance of 10 cms each. Leaves are ready for use within one and a half to two months after sowing.

To secure a regular supply of leaves, the plant can be grown throughout the year. But, if it is grown for seed, sowing should be done from September to November. The seed will be ripe in April and May.

Three to four hoeings will keep weeds away. It will need watering five or six times a week for a healthy crop.

"Mentha" ("Podeena" : Mentha Auricularia: Labiateae)

"Mentha" leaves are rich in iron, mineral salts and vitamins. The leaves have a pleasing flavour. "Mentha" is used usually for chutney. Easiest to grow, its propagation is by division of roots called suckers.

Planting is done during September, October, November, January and February so as to get a supply of leaves throughout the year. Loamy soil is ideal for "Podeena" culture. Planting should be done in rows 25 to 30 cms apart and the plants should be kept 15 cms apart. Once established, "Mentha" will continue bearing leaves for years in succession, provided, the beds are liberally manured every season with well-rotted and fully decomposed farmyard manure. Woodash is highly beneficial.

The plant requires frequent irrigation. During the dry period water should be given twice or thrice a week.

"Spinach" ("Palak" : Spinacea Oleracea : Cheno podiaceae)

Sow seeds of English varieties from mid-September to December in the plains of North India, Rajasthan, South and East Indian plains and Maharashtra. Seeds of these varieties should be sown from February-March to May-June and from September to October in the hills of North India; from February to April and

September to November in the hills of South India and all the year round in a climate like that of Bangalore.

Indian varieties can be sown almost throughout the year in the plains of India; from February to April in the hills of South India and from April to May in the hills of North India at the rate of 6.75 to 9 kg. per 0.4 hectare.

Seeds should be placed 1.25 cms deep. These will germinate within a week. Sowing can be done with drills or broadcast. The distance from drill to drill should be 30 cms and between seedlings about 15 cms. Water immediately after sowing, and repeat after 8 to 10 days. Three to four cuttings are taken before the plant begins to develop seed stalks in spring.

"Palak" has two varieties: the prickly-seeded variety with triangular leaves and the smooth-seeded variety with round leaves. This Vegetable is available from November to February. Early sowings will result in early production.

"Tomatoes" (Lycopersicum Esculentum : Solanaceae)

"Tomatoes" can be cultivated almost throughout the year except in frosty weather which the plant does not relish. For securing two early crops in the plains, once from December to March and the second time from May to June, seeds should be sown 6.25 mms apart and 6.25 mms deep. The rate of seed application is 225 gross for -0.4 hectare. Sowing in a climate like that of Bangalore is done from June to July and from October to November; from March to April in the hills of North India and from March to May in the hills of South India.

The third crop is the main crop. Seeds are sown in January with a view to transplanting seedlings at site by February and thus getting the crop from May to July. In the hills, sowing is done from mid-March to mid-May.

Seeds take about four weeks to produce seedlings fit for transplanting. Between 55 to 85 gms of seeds will be sufficient to yield seedlings for planting 0.4 hectare of land. For sowings in May to June and June to July, when the casualties among seedings are high, the quantity of seeds to be used has to be increased to 225 gms per 0.4 hectare. About 20 to 30 square metres of land is sufficient to serve the purpose of a seed bed for sowing of 55 to 85 gms of seed. About 28 gms of tomato seeds contain 8000 to 9000 seeds.

Cultural hints

Both heavy and light but well-drained soils, are good for this crop which succeeds even on acidic soils. The application of a moderate quantity of lime is helpful. Deep digging and allowing the soil to remain exposed for some time, thus making it well pulverised and application of well-rotted farmyard manure or compost at the rate oil one barrow load to 10 square metres yield good results. Work in the top 5 to 7.5 centimetre-spit of the soil. Add fish manure or any other organic fertiliser at the rate of 112.5 gms to 0.83 square metre of land.

Tomato seedlings should never be over-watered as water saturation is fatal to the life of the plant. During the wet season tomatoes do not ripen well and are often attacked by the "Potato Blight". Damage to tomato plants from wind is always high. To eliminate this danger, seedlings should be planted firm with about 1.25 cms soil over the roots and a bamboo stick should be inserted in the ground to provide a support. The tomato plant should be tied loosely to the stick.

Among the beneficial practices are qoeing intermittently, throughout the life of the plant; removal of side shoots in their earliest stages, retaining two-three main stems; removal of dry yellow leaves and confining thinning to the barest minimum by removing such foliage only as is obstructing the reach of the sun and air to the plant and spraying the tomato plant occasionally with Bordeaux mixture so as to immunise it against the "Potato Blight".

Liquinure is an excellent liquid manure providing the plant balanced food. It should be applied once a week after the fruit set.

Nitrogen should be applied in the form of nitrates and ammonium salts when the plants have just established so as to enable them to grow and produce the crop early. Application of large dozes of nitrogen, however, will prolong the growing period and delay the formation and ripening of fruit. To facilitate early ripening of tomatoes, a large quantity of soluble and available phosphoric acid and plenty of potash should be applied.

XV
Vegetable-Yielding Trees

THE LEAVES and flowers or fruits of some trees are used as vegetables. Examples of such trees are "Drumstick" (*Moringa pteryogsperma*); "Agatti" (*Sesbanea grandiflora*); "Curry Leaf" (*Murraya koenigi*); "Bread Fruit" (*Artocarus incisa*) and "Lady Love" or "Lettuce Tree" (*Pisonia alba*).

Green Papayas and Bananas are also cooked and eaten as vegetables.

"Drumstick" "Sohnja" Moringa oleifera syn. M. Pterygosperma Maringaceae

Moringa pterygosperma is popularly known as the "Horse-Radish Tree" because of the use of its roots as a substitute for Horse-Radish. It is also known as the "Drumstick" because of the 30-45 cm long and nine-ribbed yods tapering at either end. Drumsticks are eaten in boiled form or used in curries and pickles. The tender pods are cut into about 10 cm long pieces and used in the preparation of curry, vegetable, soups and in "sambar" (a soup in the South.)

Drumstick is grown from seeds sown in June and July. Propagation is also by cuttings of half-ripe wood. A sandy loam, with the addition of some leaf mould and peat, is good.

Moringa oleifera is indigenous to India. The tree is a very quick-growing one, deciduous in character and attains a height of five metres or more. The foliage is three-pinnate and the flowers which are produced in bunches are whitish and fragrant. It bears curly and round pods in March. Its bark possesses great medicinal value and a precious oil is extracted from its seed for use in artistic works.

"Agatti" "Buko" (Sesbanea Grandiflora Leguminosae)

Sesbanea grandiflora is a native of India and Mauritius and is popularly known as "Agatti" (in the South) or "Buko" (in Bengal). The tender leaves of the tree are edible. The green and fleshy, petalled white or red, flowers are consumed after frying them.

The tree is shallow-rooted. Each leaf varies from 15 to 30 cms in length and bears 41—61 leaflets. The tree is propagated from seeds is quick growing, and attains a height of six or seven metre. Since it bears thin foliage, it does not cause any damage to vegetables if it is planted in a comer in a kitchen garden. The tree flowers within a year of the sowing of seeds. Thereafter, it should be cut away and fresh plants be grown from seeds.

"Curry Leaf" ("Karapincha" : Murraya Koengii Rutaceae)

Murraya koengii is indigenous to India and is popularly known as "Karapincha" or the "Curry Leaf". The leaves are pinnate with each leaf bearing 10—20 leaflets. These are used in the flavouring of soups and curries. The leaves are also used in making pepper water and chutneys. The roots, bark and leaves are also used as a tonic in India. The foliage is aromatic possessing a slightly pungent flavour.

The tree can be grown from seeds. It relishes a light rich sandy loam which should be kept towards the drier side in order to obtain a better yield.

"Bread Fruit" (Artocarpus Incisa syn. A. Communis Moraceae)

Artocarpus incisa is a tree of tropical origin relishing a rich loam and copious watering. Its fruit is 10 to 15 cm in diameter, generally seed-less, "muricated to reticulated", oval in shape and is quite soft. This level of softness as in the inside of a "loaf of bread" has led to the tree being named "Bread Fruit". It is eaten more in the cooked form as a vegetable than as a fruit.

Propagated from suckers, the tree is quick-growing and reaches a height of 10 to 13 metres. It bears 30 to 90 cm long evergreen leaves. These leaves are devoid of any serrations at the base but are three to nine-lobed in the upper regions. The trees look highly ornamental.

"Lady Love" ("Lettuce Tree" : Pisonia Alba Nyctaginae)

The leaves of this plant possess medicinal value proving highly effective in rheumatic complaints. They are cooked and eaten as a vegetable. The foliage is of a pale green colour and is borne densely on the tree.

"Tapioca" (Manihot Utilissima: Euphorbiaceae)

In South India the common names given to this plant are Maravelli Kilangu and Mara Genasu. A native of tropical America, *Manihot utilissima,* commonly known as *Tapioca*, is suited for cultivation in terrain up to altitudes of 1300 metres in India. It is a pretty-foliaged plant, the roots of which are large and fleshy. It is fit for human consumption after boiling or roasting, as, by these processes, the prussic acid which is poisonous is removed. The tubers are also used as a food. The palmate and long-petioled leaves are extremely fascinating to look at. It can therefore be also cultivated as an ornamental plant.

The roots are fit for use between 8 to 12 months of the planting of the tree. Planting is done by laying out 22.5 cms to 30 cms long cuttings, about a metre apart, in rows 1½ to 2 metres apart. *Tapioca* relishes a dry, rich and easily-breakable soil. In such a soil, the tubers develop well.

XVI

Laying out a Fruit Corner

UNIIKE AGRICULTURE crops, fruit trees are perennials. They remain at the fixed sites throughout their long life. The home gardener must give thought to the selection of a site for fruit plants.

Soil, climate and irrigation facilities must be considered. Over-sandy or clayey soil or water-logged soil is unfit for fruit-growing. Generally, a soil that has been under vegetable cultivation for about two years and has proved its capacity to produce good quality vegetables, would be suitable for fruit trees. Shallow soils and soils infested with a mixture of carbonates, sulphates and chlorides of sodiums, besides containing some other salts of magnesium and calcium, are to be avoided.

Soils with a depth from 25 cms to 45 cms are suitable for strawberries. For large spreading trees, a two-metre deep and uniformly textured and well-drained soil is deemed ideal. The depth of three metres is excellent. Too alkaline or too acidic a soil is to be avoided. The pH value of a soil fit for fruit cultivation should vary from six to eight.

Time Schedule

The planting season varies with the regions and types of fruit trees. For the plantation of the evergreen fruit trees, the rainy season (July-August) is the best, although planting could be done in spring too, i.e., from February to March. For plantation of deciduous trees, the ideal season is the one when the plants are dormant, but before the buds begin to swell.

A month to a month and a half before the planting of the fruit trees is the proper time to dig pits 1.2 metres deep and 1.2 metres in diameter. The soil should be exposed to the sun for at least a month or a month and a half, after which the pits should be re-filled with soil, mixed with manure.

Planting Patterns

For planting patterns, there are the "Square", the "Triangular", the "'Quincunx", the "Rectangular" and the "Hexagonal" methods for the plains, and, for the hilly tracts, the "Contour" system. The "Square" and the "Rectangular" methods are the most widely used. In the former, the distance from plant to plant in a row is the same as the distance between the rows of plants. Putting the trees in a row closer together with a view to having more trees per hectare is known as the "Rectangular" method. In both these methods, the trees are planted in straight lines, running at right angles. This method is neat and clean and facilitates irrigation in two directions.

In the "Triangular" system too the trees are planted in a straight row with this difference that the plants in the two rows are not opposite each other; each tree in one row is midway between two in the opposite row. In the "hexagonal" system, the trees are planted in the corners of equilateral triangles. This system is, therefore, also known as the "Equilateral triangle" method. Six trees form a hexagon around one in the centre. By this method the same area can be made to take 15 per cent more trees than in the "Square" system. If an extra tree is provided in the centre of each square in the "Square" system, it becomes the "Quincunx" system. The central tree is called a "filler". The number of trees is roughly doubled in this case. The "fillers" to be planted are "temporary" trees such as the papaya, which are to be removed after two to three years when the permanent trees come up.

After the pits are ready for planting, the holes for receiving the young plants should be dug 22.5 cms in diameter and 22.5 cms to 30 cms deep. The young plants should be provided with supports and protected from the cold from December to the end of January, It is advisable that watering should be done in the evenings, specially during the summer. Otherwise, the water will scorch the roots because of excessive heat.

Wind breaks

Wind-breakers should be provided around the fruit garden in order to protect the trees when young as well as in the fruit-bearing stage. Strong winds dry up the flowers in the case of citrus plants and uproot many trees laden with fruit. In commercial gardening, therefore tall trees like *Mangifera indica* (desi mango), *Syzygium cuminii* (Jaman), *Eucalyptus citriodora*, *Dalbergia sisoo* (shisham). *Terminalia arjuna* (arjun) and *Morus alba* (mulberry) provide an effective line of wind-breakers. In home gardens, which have large areas devoted to fruit plants, a similar line of plantation will stand the gardener in good stead. However, for small fruit garden areas, tall shrubs alternated with dwarf ones will be immensely helpful in providing effective windbreakers.

The first row of fruit trees should be planted on the inside of the wind breakers at a distance which should be equal to half of the distance at which trees are to be spaced in the fruit garden.

The distance between the fruit trees themselves will differ according to the plant. Grafted mangoes are planted 12.2 metres apart; guava and loquat 7.5 metres apart, plants of the citrus family 4.6 metres to 7.5 metres apart and papayas about 3 metres apart.

Most of these fruit trees will start bearing at the age four to five years. Papaya will bear fruit in one year. Until then, the space between the young plants can be put under vegetables or fodder crops such as *Trifolium alexandrinum*, (*Legriminosad*) known by the English name of *Egyptian Clover*, and in the vernacular as Berseem and *Trifolium resupinatum*, known by the English name of Persian Clover, and in vernacular as *Shaftal*. A heavy feeder like maize should not be grown. Leguminous crops are suitable, as these enrich the soil with nitrogenous matter. Vegetable cultivation, used as inter-cropping, in the crop rotation method, will bring good returns until the trees come of fruit bearing age.

The soil should be kept clean, hoeing should be done and some green manure crop should be grown during the rains and ploughed in. Keeping the trees in proper form by trimming and pruning, spraying with insecticides, keeping the fruit safe from outside dangers and picking them at the right time will give good results.

XVII

Selected Fruit Trees

Plants For a small Garden in the Middle

AS RESIDENTS IN cities have a rather limited area for kitchen gardening, it will be advisable to limit cultivation of fruit plants to the dwarf and medium-sized varieties. Enumerated below are some fruit plants ideally suited for the purpose. However, these restrictions do not apply to fruit cultivation in large gardens.

Among the plant varieties described are fruits of the citrus group, the grape group, the fig group and other fruits such as papaya, phalsa, pear, peach, plum and banana.

The Citrus Group (Rutaceae)

Most of the citrus plants viz. "Sweet Oranges" (Citrus Sinesis) comprising the "Common Malta", "Malta Blood-red" and "Mosambi" of Bombay-Deccan; "Mandarin Oranges" (Citrus reticulata), popularly known as "Santra" and consisting of loose-jacketted oranges such as "Nagpur Santra", "Khasi Orange" and "Coorg Santra"; Limes; Lemons; Grapefruits and Pummelos are ideal for growing in kitchen gardens or compounds of bigger residences. Some of these plants should be propagated from seeds and in other cases only budded plants be planted securing the best results. For example, the loose jacketted oranges, i.e. Mandarin oranges and "Kagzi Nimboo" are usually propagated through seeds whereas "Nagpur Santra" is propagated by budding.

Raising Plants

The first week of September is ideal for sowing seeds of "*Khatta*", "*Jatti Khatti*" and "*Kharna Khatta*" to get stocks ready for budding of "Sweet Oranges", "Mandarin Oranges", Limes, Grapefruits and Pummelos in the plains of North India. In Punjab and U.P., the rootstocks used for propagation of Lemons are "Jatti Khatti" (Rough Lemon-Citrus Lemon) and "Karna Khatta". For "Sweet Lemon" the best rootstock is "Jatti Khatti". For propagation of "Common Malta" and "Mandarin Oranges", "Karna Khatta" (Citrus Karna) is the best rootstock. "Jatti Khatti" is the ideal rootstock for "Malta Blood-red" and "Valencia Late Orange". In Western and South India, seeds are sown from May to June or from September to October for the preparation of stock plants.

"Jamburi" (Citrus Lemon) is the rootstock used for the propagation of "Mosambi" and "Nagpur Santra" in Bombay and Madhya Pradesh. It is also used as a stock for "Sathgudi" in the South. In Bombay, "Rangpur Lime" is also used as a rootstock for the propagation of "Mosambi". For budding "Kagzi Nimboo", the stock used is "Routh Lemon" ("Jatti Khatti") and "Jarnberi" or "Jamburi" in North India. In South India the rootstock used is "Gajanimma". "Italian Lemon", seedless, is budded on "Jamburi" in the Deccan.

Selection of seed

A simple test is adopted for selection of good seeds. Place the seeds in water: only those which sink to the bottom should be used. Discard the ones which rise to the surface.

Seeds should be sown in beds immediately after their extraction as otherwise these lose their viability. Use the "rosing machine" for extraction of seeds as hand-extraction is not so economical.

Seeds are sown on raised beds on land which is about 30 cms higher than the ground level. A metre and a half long, 90 cms wide and 30 cms apart, the beds should be in rows 60 cms apart. Seeds are sown three mms deep in the small beds, at a distance of 2.5 cms from one another, in rows 15 cms apart. The seeds are covered with a little soil after the sowing. A 6 mm thick layer of sand should be spread over this to prevent the formation of a crust likely to be developed as a result of daily watering. The beds should be kept moist. Watering should be done with the water-can fitted with a fine nose.

Germination will take place in two to three weeks. A careful watch should be kept against dampness and over-crowding as both these factors encourage fungus attacks, which ruin the seedlings. The fungus sends white mycelia which cover the stems of the seedlings and cause "damping off", a serious malady. The affected seedlings should be removed and "Chestnut Compound" should be used to arrest the spread of the disease. As soon as the disease is noticed, the other seedlings should be transferred to a fresh soil, which has been treated with "Chestnut Compound". The disease can be caused by a number of factors such as insufficient air or light, over-watering, thick-sowing and over-crowding, too much dampness in the air or in the soil and over-shading.

The "Chestnut Compound" is made by mixing two parts (by weight) of copper sulphate with 11 parts by weight of ammonium carbonate. The ammonium carbonate and copper sulphate should be powdered separately. The two should then be mixed and stored 24 hours before use. To prepare a solution, dissolve 450 gms of the dry mixture in some lukewarm water. Add 18.2 litres of water to this lot.

During winter, the young seedlings should be sheltered from extreme cold. Seedlings are transplanted to the site where budding is to be done during the following October. These are kept 30 cms apart in rows which are themselves 60-75 cms to 90 cms apart. The seedlings should be thoroughly watered immediately after transplanting. Weak seedlings should be discarded at this time. The selected ones are allowed to remain till the time of actual budding. Thus, it takes a year and a half to two years for the stock to be ready for budding, from the time of sowing of the seeds.

Budding

Budding may be done at any time of the year provided the stock is in an active period of growth. Bud-wood should also be in a swelling stage. It should be done in the stem 15 cms above the ground level. "Shield" budding or "T" budding is the method in vogue.

Spring or late rainy season is the best time for budding; February, March, August and September being the good months. For commencement of budding, the flow of sap in the stock and the scion should be taken into account. The stock and scion should be full of sap at that time. In order to make the sap flow earlier in the stock, it is advisable to apply ammonium sulphate at the rate of 75 kgs. to 405 hectare of the land on which the seedlings are standing. Bud-wood should be taken from only such trees for which proper records have been maintained and are prolific bearers, with foliage free from disease. The tree itself should be strong, disease-free and capable of producing good-quality fruit in good quantities. The fruit it bears should also be thin-skinned and of good flavour. The branches from where actual bud-wood is to be taken should be a year old mature and marked with white streaks. Bud-wood should not be taken from water suckers or angular wood.

Stock and scion being ready, "Shield" or "T" budding is done. In "Shield" budding, a T-shaped cut is made in the bark of the seedling after rubbing off all the side growth on the stock up to the point of budding. No suckers arising from the base of the stock as well, should be allowed to remain. In making a T-shaped cut, first a horizontal cut is made across the bark, about 1.25 cms above the bud and only so deep as to cut the bark alone. A longitudinal cut is then made starting from the middle of the horizontal cut, passing it through the middle of the bud and taking it further with the length of the cut, not extending more than 2.5 cms. The inside wood should not be allowed to be bruised or injured at all. Thereafter, the bud should be cut down cleanly to bring it in level with the level of the bark.

In "Shield" budding, a suitable bud selected on the young shoot of the current year is sliced in the form of a shield and detached from the branch carefully. The wood attached with the bud is removed with the pointed end of the budding knife but the eye or the core of the bud is left intact. This bud is lowered down from up wards between the wood and the bark at the point, the horizontal cut was given on the stock. This is done by holding up the bark from the sides so that the bud saddles comfortably in position on the wood' at a point where the bud was shaved to the level of the bark on the stock. The lifted bark on the sides is allowed to come back to its original position. This area is tied firmly with raffia or banana fibre or polythene from downwards to upwards so as to exclude all air. The leaf stalk which was present in the bud is allowed to remain protruding. Six or seven weeks after budding, the stock should be headed back beyond the point of union of the scion with the stock and, scion is allowed to grow. A year-old budded plant is fit foe being put in the garden.

"Sweet Oranges" (Citrus Sinensis)

"Sweet oranges" include the Malta of the Punjab, the Mosambi of Bombay and Sathgudi of South India. These flourish well in regions having a dry climate, little rainfall and a distinct summer and a winter. It does not relish heavy rainfall and humidity. For "Mosambi", a popular fruit of Western India, annual rainfall between 50 cms and 75 cms from June to September is good enough. "Malta" does not relish humidity and is therefore grown to perfection only in North India, Uttar Pradesh and North Rajasthan, where the rainfall from June to September ranges between 20 cms to 75 cms. "Sathgudi", also known as "chini", can be grown very successfully in the dry regions of the South.

Plants are grown from seeds as well as by budding. A light-to-medium loamy soil with a slightly-heavy sub-soil is best for "Sweet Oranges". The provision of wind-breaks in the south-west corner is essential in order to provide protection against high temperatures and winds during the flowering stages.

Pits should be dug up one metre deep and the soil should be re-filled after mixing the top spit soil with 22.5 kgs to 27 kgs. of farmyard manure, 900 grams to 1.35 kg of bone-meal and 2.25 kgs to 2.7 kgs of wood ash. "Sweet Oranges" may be planted five to six metres apart. In hilly areas, three to five metre wide terraces should be made parallel to one another and one above the other. The planting season in the South is July-August; in North. January and August-September. Keep the budding point 15 cms above the ground level after planting and make the soil around the plant firm. Watering of the young plants throughout the year especially during the dry season is very essential. Watering should always be done slightly away from the trunk in order to avoid the formation of brown spots on the trunk.

Though the bearing of fruits in "Sweet Oranges" and "Mandarin Oranges" starts from the fourth year, the crop is prolific from the seventh year onwards. In regions of distinct winter and summer, i.e. North India, the trees produce one normal crop a year, i.e. from February to March.

A year-old "Sweet Orange" plant should be given a mixture of 6.80 kgs to 9.10 kgs of farmyard manure and 275 gms of castor cake. In the second year, the plant should be given 12.40 kgs to 13.60 kgs of farmyard manure and 450 gms castor cake. This dose is applied every year for a period of six years in December-January in North India and during rains in South India, the Deccan and Bombay regions. After the trees start bearing fruit the application of manure varies with the texture of soil.

In South India, 31.75 kgs to 36.30 kgs. of farmyard manure, 4.50 kgs to 6.70 kgs of bone-meal and 4.50 kgs to 6.70 kgs of wood ash are applied per tree; in UP and Punjab, the rate of application of manure per tree is 22.70 kgs to 27.20 kgs. of farmyard manure and 1.80 kgs to 2.70 kgs. of sulphate of ammonia and in Bombay-Deccan, 31.75 kgs to 36.30 kgs. of farmyard manure, 4.50 kgs to 5.40 kgs. castor cake and 910 gms to 1.40 kgs. of superphosphate per tree.

Plant Description

"Sweet Orange" or "Santras" having a 30 to 60 cm straight, clean stem and a few well-spaced branches are selected for planting at site.

"Mosambi". (citrus sinensis) a popular variety in Bombay and in the humid regions of South India attains a medium height and a rounded top with regular branches. The fruit is thin-skinned with the pulp apricot yellow and juicy. The rind is marigold-coloured but remains green or green with a yellowish tinge under tropical conditions. The flavour is not well marked.

"Sathgudi". (citrus Sinensis) popularly known as "Chini" is a promising variety grown in South India. It grows into a medium-sized tree and assumes a rounded shape with branches borne in a regular fashion. The fruit is medium-sized with the pulp straw-coloured, juicy and flavoured.

Grapefruit also called Pomelo (Citrus Paradisi)

"Grapefruit" is a rich source of vitamin-C and B. The taste on the pulp is however slightly bitter. "Grapefruit" will do well in a soil similar to that recommended for the cultivation of "Sweet Oranges". Its cultural routine is also similar to that of "Sweet Oranges". "Grape-fruit" will grow well in the dry regions of Punjab and even in the humid areas of Nilgiris up to 1000 metres.

The planting distance from plant to plant varies from five to six metres. The tree has a tendency to grow low and dwarf, consequently requiring less pruning. Propagation is by "T" budding. The root-stock yielding best results are "Kharna Khatta" in the Punjab and "Jamburi" in South India and Bombay. The popular varieties are "Marsh Seedless Duncan", "Saharanpur Special" and "Poona Budded."

Pummelo: Citrus Grandis

It is rich in vitamins A, B and C. Propagation is by budding using "Jatti Khatti" and "Jamburi" as the rootstocks. It can stand heavy rains also and relishes a warmer situation as compared to "Grapefruit". Each tree produces 80-100 fruits. The fruit is available from January to March in Punjab and from September-November in Bombay-Deccan. The soil and cultural routine is similar to that followed for "Grape fruit" and "Sweet Oranges."

Kagzi Nimboo or Kagzi Lime: Citrus Aurantifolia

"Kagzi Nimboo" flourishes in tropical areas. It relishes a deep, well-drained loamy soil but not water-logged soils and frost.

Seeds are sown in February-March and August to September in North India and, in South India including Bombay-Deccan, in May-June and September to October. The seedlings when 10 cms high, should be transplanted 25 cms apart, in rows 60 cms apart. After a year, they should be planted at the required sites, three to five metres apart. Protection of plants from extreme heat and frost in the initial stages of growth for the first two years is necessary. The cultural routine is similar to that followed for oranges.

"Kagzi Nimboo" plants grown from seeds are more resistant to disease and rough weather than the budded ones. The bearing of fruit starts in the fourth year. The fruit is available in August-September in North India and in March-April in South India. The main crop in Gujarat, Maharashtra and Deccan is on from July to September and a small quantity is available from February to May. "Baramasi Kagzi Nimboo" produces fruit throughout the year. The two popular varieties of "Kagzi" lime worth growing are oval and round. In Bombay-Deccan, the ideal variety worth growing is "Rangpur Lime" which is frost-resistant. "Kagzi Nimboo" grows into a spreading, dense, thorny tree with small foliage, white flowers and thin-skinned fruit with pulp, greenish and acidic.

Sweet Lime: Citrus Limetta

It is popularly known as "Mitha" or "Mitha Nimboo" and is propagated by cuttings and budding. The stock used for budding is "Jatti Khatti" in Uttar Pradesh and Punjab. It grows into a hardy, large spreading tree bearing fruit in abundance. The fruit is small-size, pale-yellow and thin-skinned. The pulp, which lacks in flavour, is mild in sweetness, with no acidity.

Lemons: Citrus limonia

"Eka" "Italian" and "Libson" and "Villa Franca" are the popular lemons grown in India. In lemon, the leaves are larger as compared to leaves in Lime and are devoid of wings. The flowers are purple. The fruit is also larger and weighs more than Lime. The pulp is pale-yellow and less acidic. The skin is thicker. The tree assumes a straggling appearance. The rootstock, used for budding these lemons is "Rough Lemon" ("Jatti Khatti") in North India.

Nagpur Santra (Citrus reticulata)

One of the excellent "Mandarin Oranges" of Bombay and Madya Pradesh, it has a moderate spread, assumes a compact form, and is devoid of spines. Although it relishes a dry and hot climate, it grows well in regions of heavy rainfall if the soil is rich and well-drained and also in areas with altitudes upto 1000 metres. The tree is a prolific bearer and the fruit is sub-globose and smooth-skinned. Each fruit weighs 4 to 6 ounces. The pulp is of marigold colour an contains plenty of juice.

Coorg Orange (Citrus Reticulata)

It is a very popular variety in South India growing well in regions with altitude upto 500 metres. It florishes better in humid areas. It is a large tree propagated from seeds which assumes the shape of a column. The fruit is medium and thin-skinned and oblate to globose in shape. The pulp is chrome-coloured containing plenty of juice in which acidity and sweetness are well balanced.

Khasi Orange (Citrus Reticulata)

A mandarin orange, this plant is a popular variety in Assam. It is erect, medium-to-tall, and with globose and thin-skinned fruit. The pulp is slightly coarse but sweetness and acidity are well balanced.

Desi Variety (Citrus Reticulata)

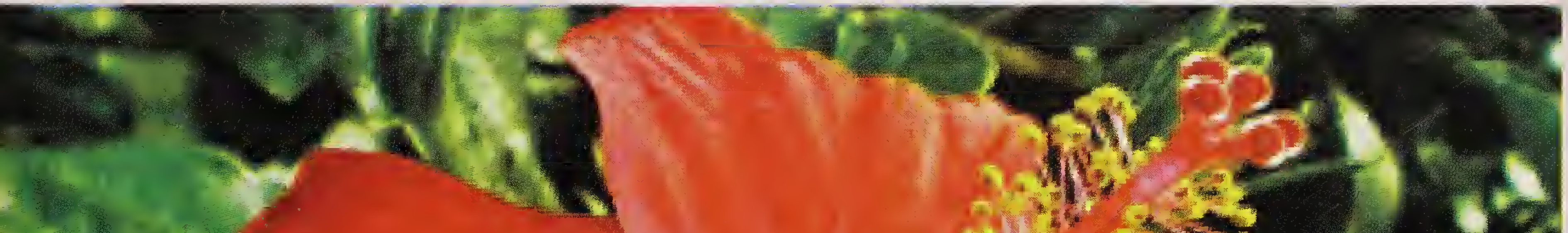
The tree grows large and assumes a semi-upright posture. The fruit is borne in abundance. The pulp is deep chrome in colour, juicy, but slightly acidic. The trees are mainly grown in the Punjab hills and to some extent, in the plains of Punjab.

"Santra" responds extremely well to the use of farmyard manure at a rate varying from 11.30 kgs to 13.60 kgs. per tree. Watering should always be liberal after manuring. Thereafter, watering once in a week or a fortnight, keeping in view the soil condition and weather, is sufficient. Generally, sandy soils need more frequent watering than clayey soils.

Carissa Carandas (Apocynaceae)

"*Carissa Carandas*" is also known as "Karonda", "Caraunda" or "Christ's Thorn". *Carissa Carandas*, often grown in ornamental gardens as a hedge, is a useful fruit plant. The three prominent varieties of this plant bear pink, white, and green and

Carnation



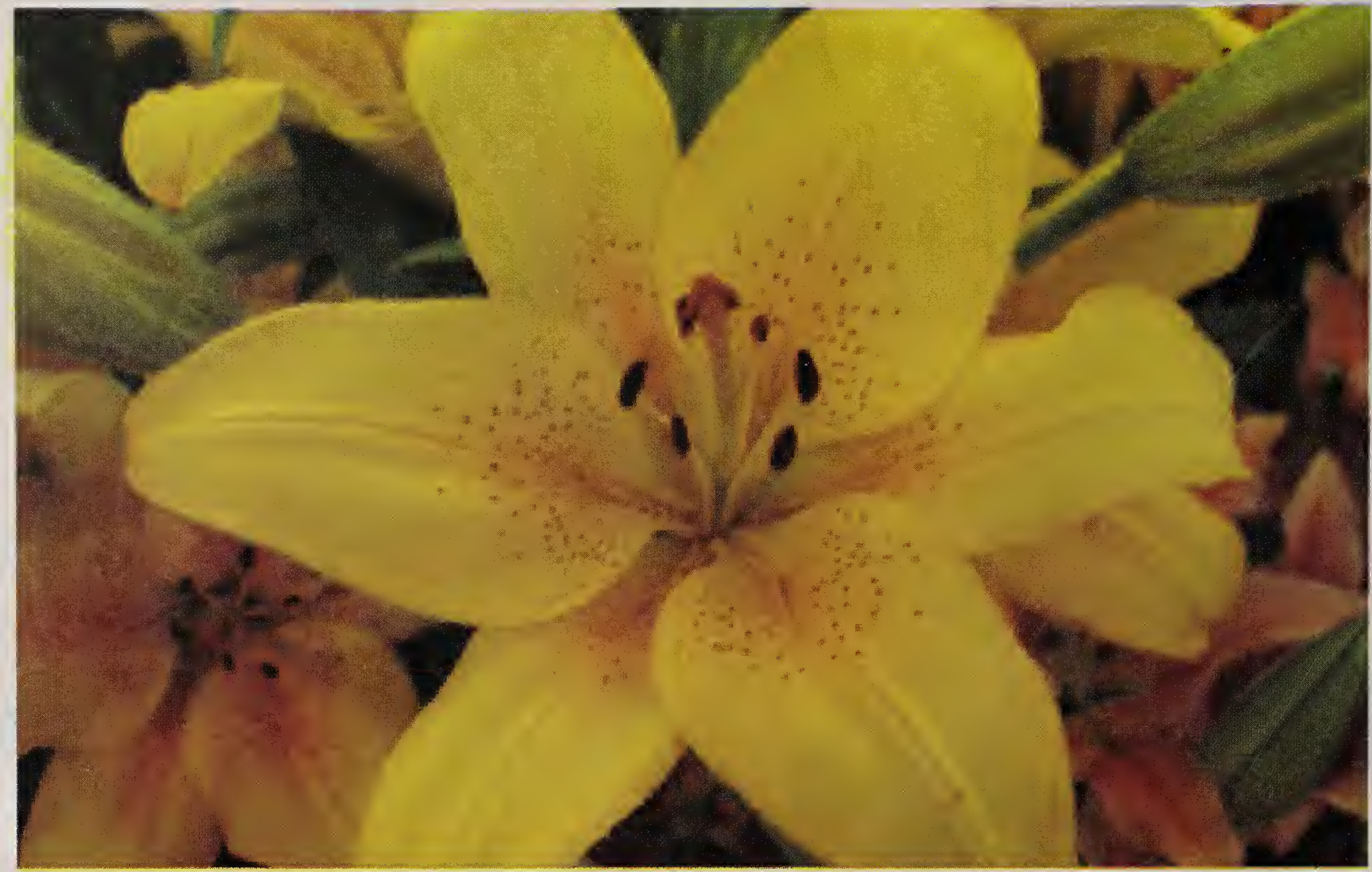
Hibiscus

Champa

Cannas

Dianthus

Helianthus



Lily

Spider Lily

berry-like edible and pleasantly-flavoured fruit. It can be grown in hills as well as tropical and sub-tropical areas.

The tree is grown from seeds which need to be sown immediately after their extraction from fresh fruit. Seedlings are transplanted when about 7.5 cms high. Watering once a week in summer, and once in a fortnight during winter, is sufficient.

Flowers which are white and fragrant, appear in clusters of two or three in February. The fruit is ready for picking from August to September. The early flowering varieties produce the fruit crop in the rainy season. Unripe fruit is used for making pickles and ripe fruit is used for jelly. *Carissa Grandiflora* "Natal Plum" has white flowers and dark-red fruit. The fruit is used in making sauce and jelly. Propagation is by layering.

Custard Apple

Relishing a sandy-to-medium loamy soil, a hot dry climate, standing up well to a rainfall of 50 cms. to 75 cms, "Custard Apple", popularly known as "Sharifa" or "Sitaphal", yields fruit at the rate of 50-70 per plant from September to October. "Custard Apple" is drought and white-ant resistant. However, water-logging damages its roots.

The soil is dug up at least 60 cms deep. The earth is put back in the same pit after mixing it with tank silt and wood ash. Wood ash is to be added at the rate of one to two basketsful per pit. Pits are to be spaced three to four metres apart. Seeds are sown in pits after soaking them for three to four days in water. Seedlings do not stand transplanting well and hence the seeds are sown at site. Propagation is by budding and marching also. Budding is best done from February to June and in September. "Shield" budding is the method in vogue. Budded or grafted plants are also planted. Plants propagated from seeds will take five to six years to bear fruit whereas the grafted or the budded plants will bear fruit in the fourth year.

"Custard Apple" puts forth flowers in two flushes from March to July. The fruit is ready for harvesting from September to October.

A couple of irrigations at the time of ripening of the fruit are sufficient. Too rich a soil and frequent watering are not needed for "Custard Apple". After bearing fruit, the tree will enter a period of dormancy, shed off its foliage by December, re-awaken to life in spring and put forth new growth. The application of bone-meal and superphosphates and good cultivation prevent the fruit from turning brown after ripening, thus avoiding formation of stone fruits. Popular varieties are "Mammoth Balanagar", "Sitaphal" and "Washington".

Pomegranate : Anar : Pelnica Granatum Lythraceae

A native of Iran, the "Pomegranate" relishes a cool winter and a hot-and-dry summer. In areas where the temperature goes below 12° F, it is susceptible to a damage by frost. Otherwise, it is grown all over India in regions located up to altitudes of 1000 metres. In regions of extreme and mild winter, the "Pomegranate" sheds its leaves, whereas, in tropical and sub-tropical areas, it maintains an evergreen character or sheds leaves only partially.

Like "Phalsa", "pomegranate" could be grown in an ordinary soil and even in limey or slightly alkalinic soils. A deep loam is, however, the best. The "Pomegranate" is propagated by seeds, cuttings, layering and root suckers. The method for growing it from cuttings is preferred as the plants, grown from seeds show variations in quality. There is also no surety of the plant retaining the characteristics of the parent. Cuttings, 25 cms to 30 cms long and about 7 cms in diameter are taken from a year-old wood, are stripped of leaves and planted 25 cms apart, in rows located 45 cms from one another. The cuttings should be planted in a shady place during spring or the rainy season in North India and in rains in South India. A year-old rooted cutting is fit for planting without a ball of earth at site during spring in areas where the "Pomegranate" sheds off its foliage. In Western and South India, transplanting is done during the monsoon with balls of earth remaining intact. Plants may be placed three to five metres apart and watered every day for about seven to ten days after planting. Thereafter, the irrigation may be reduced to once a week.

About 9.10 kgs. of farmyard manure, 168.75 gms. of ammonium sulphate and 450 gms. of cake are applied per plant in February in North India and just before the rains in Western and South India. Every year, the dose of application is increased by the same quantity as is applied to a year-old plant. A three-year-old plant will require 27.30 kgs. of farmyard manure, 506.25 gms. of ammonia sulphate and 1.40 kgs. of cake.

A bush form may be given to the plant by retaining four to five main stems arising from the base. In North India, the "Pomegranate" sheds its leaves in winter after entering the period of dormancy. Flowers appear in March-April and the fruit is harvested after ripening in July and August. In Western and the other parts of India, where the tree never has a period of dormancy, it is forced to go to rest by withholding water. Root pruning is also done in some cases and the tree is thus made to bear one main crop. Normally there are three major flowering periods known as "Ambe-bahar", "Mirh Bahar" and "Rasth Bahar". The trees continue growing throughout the year.

"Grapes" : Angoor : Vitis Vinzfera (Ampelidaceae)

"Grapes" can be grown even in a home garden. Plant a vine or two before the advent of spring along the wall of your drawing room. This vine will serve as a green screen imparting coolness in regions of scorching heat as well as giving a bumper crop of luscious grapes. In regions where the vine shed their leaves in winter, sunshine will be available in winter, but in regions where the grape vines do not enter a dormant stage, an evergreen screen is provided throughout the year. These evergreen varieties provide two crops in a year.

When a vine is planted, it can yield fruit for at least four or five decades. Hence the soil pits for it should be properly prepared. Dig a pit 60 cms to about a metre deep. Clear the soil of all rubbish. Refill after exposure to the sun, with soil and manure in the ratio of 1 : 2. Water the site to allow the soil to settle down. Put more of the mixture of soil and manure, if necessary, keeping the pit level 2.5 cms below the surface level. Place in the top 12 cms pit of the soil, bones to provide nourishment after a couple of years. Bones in the soil also improve the texture and quality of the fruit. A light soil with good drainage is always preferable. A water-logged situation kills the vine. The distance from vine to vine should vary from two metres to two and a half metres and the space between rows should be two and a half metres.

A sunny location is the ideal, as in shade the plant may have vegetative growth but produce no fruit.

Cuttings

In North India, medium-sized and 23 to 30 cm long cuttings are prepared from prunings, from a year-old wood, made in the dormant season. Each cutting should possess three to four buds on it. The cut at the lower end of the cutting should be immediately below the lower-most bud and the upper cut about 12 mms above the top-most bud. Cuttings, tied in bundles should be placed in moist saw dust or moist sand, for about a month, by which time the callous will be formed. The calloused cuttings should be planted so deep as to let one bud remain above the ground level in nursery beds, 30 cms apart, in rows which are to be spaced 60 cms to 75 cms apart. One-year-old plants are placed at the required sites in February, without balls of earth.

In South and Western India, cuttings taken from the prunings of October, are planted 30 cms apart in rows which are 60 cms to 75 cms from each other. When about three months old, the rooted cuttings are planted at site in January. Plant a year-old grape vine in the evening after a rain shower, ensuring that the soil is workable. Water the place copiously. A stake may be provided before planting so as to give support to the tendrils to climb up.

Training & Pruning

Properly nurtured, the vine will grow. Training and pruning are very important operations which are to be attended to carefully. These operations govern the fruit-producing capabilities of the vine and account for the good wealth of the plant. Whether grown as a commercial crop or on a small scale in a home garden, the grape vine should be pruned every year, either late in autumn or early in spring. But before pruning is undertaken, it is necessary to ensure that the flow of the sap has not started. This can be seen by examining the buds, the swelling of which indicates that the run of the sap is on.

As a matter of fact, the grape vine needs to be tended from the initial stages when it is planted as a year-old sapling. Almost a year later, the vines have to be pruned, thus making it a seasonal operation. The vine should be planted about 3.40 cms deeper than when it is grown in a nursery. At the time of planting, damaged or bruised roots should be removed and the top should be headed back to two to three buds. Different methods of training and pruning of grapes are to be followed in different regions of the country.

The most popular methods are described below.

Head System

This system is practised in the Punjab. Posts should be provided five metres apart with three wires strung lengthwise, about 45 cms one above another. The posts are placed about 45 cms in the ground and a metre and half outside. The stem of the plant should be allowed to grow straight along the post during first summer. The side branches should then be pruned off, allowing the central strongest one only to become the trunk. The central branch should be cut to a height of about one metre in the beginning of July and tied to the wire by a loose string. Laterals will rise and three or four of the strongest should be retained in a well-spaced manner and allowed to grow along the wires till the vines enter the period of dormancy in the month of December.

During the first pruning undertaken when the vines are dormant, the trunk should be cut to the height of the post and the laterals should be cut back to two to three buds. A number of shoots will rise and grow till the next dormant stage, forming a nice framework for the plant. In the second pruning, eight to ten well-spaced branches should be retained and shortened to two to three buds. In the third year the vine will start yielding a crop. Before spring the buds start swelling, revealing that the sap has started running. Growth will be rapid during spring and the plants will be in their full majesty during the summer months. The crop will be ripe by the end of May in the plains of North India. It should then be picked, as after the end of June it will start deteriorating.

Cane System

This system is also good for the Punjab and the plains of North India. In the "Cane System", the central trunk is allowed to develop as in the "Head System." Two or three well-spaced canes are allowed to spread on either side of the trellis along the three wires. It has been observed that pencil-sized stems or canes are the most dependable 'bearers. "Fruiting" canes, with 10 to 12 buds on each, should be selected with the number of canes on either side being kept from four to six.

An ideally-pruned grape vine is one which has 48 buds to 60 buds on it. Branches other than the ones bearing these buds should be pruned. Retain four to six buds on each of these branches at reasonable intervals close to the side canes to take the place of the "fruiting" canes when those selected currently have borne fruit. Pruning should be done on the principle that the branches that have fruited should be pruned off and four to six branches emerging from the retained buds close to them should be pruned to 10 buds to 12 buds, retaining four to six buds close to the side canes at reasonable distances. The laterals arising from these side canes can be retained, if advisable and in that case they are pruned to three to four buds. The trunk should never be allowed to grow higher than the height of the posts.

The "Cane System" is very effective for varieties like "Black Prince", "Fosters' Seedling", "Kandhari" and "Kishmish" (Bedana). In "Bedana", the unfruitful buds are present at the base of the cane.

Pergola or Arbour System

In this system rooted cuttings should be planted, in early February, two metres apart on either side of the pergola or arbour. The width of the arbour should be kept two metres and the height from ground level two and a half to quarter to three metres. The central trunk should be allowed to grow to a height of one metre and then be allowed to put forth three branches. These branches should be tied to the horizontal wires of the pergolas. As these grow, they should be made to climb up across the sides of the pergola and spread over the roof.

For pruning grape vines in the "Pergola" or "Arbour" System, the principle to be followed is to thin out the branches of a size less than that of a pencil or canes of a size larger than that. Prune the pencil-size canes to 10 to 12 buds, cut the canes of the previous year's growth to one fourth of their length and cut back the laterals to three to four buds each. A grape arbour treated thus will provide nice shade, give a very presentable ornamental look and produce a good crop. After 50 to 60 years, the arbour may show signs of decline and may produce no fruit at all. At that time it is advisable to cut off the vines to the ground level when new growth will sprout, revitalising the arbour and making it look as grand as it was before. But, it takes about three years for the arbour to be fully covered.

Various Systems of Pruning

In Western and South India, grape vines do not at all enter the dormant stage. They continue to grow throughout the year and produce two crops.

In Madras, grape vines should be pruned in summer, in May, The crop will be available from September to November. It will however be slightly sour. The second pruning done in early December will enable the vine to produce a sweet crop in the month of April. In Bangalore, pruning should be done from March to April and for a second time, from September to October, in order to obtain crops in January and February and July and August.

In all pruning systems, all dead and diseased wood should be removed immediately when noticed on the vines. A single grape vine produces good crops for about 20 to 30 years in succession. It needs rejuvenation after that period. For this the trunk should be pruned. A cane of the thickness of a pencil should be retained and allowed to take the place of the trunk, repeating the pruning as stated in the different systems. Thus, the vine will produce the same quality crop, not delaying the next fruiting time on this account. Replacement of the trunk should be done simultaneously at pruning time. The vine thus treated will bear a prolific crop of grapes for several years to come. One vine can bear grapes for 50 to 60 years, after which new plantings are necessary.

Single Stake System

In the "Single Stake System", which is prevalent in Western India, two-metre long cuttings of *Erythrina indica*, popularly known as "Pangara", are planted two and half metres apart in rows. The roots of "Pangara" are capable of fixing atmospheric nitrogen and thus enriching the soil with nitrogen. Bamboos are tied on the "Pangara", supports along the row of vines on the beward side. After plantation the main stem of the grape vine is tied to the "Pangara" support and is allowed to grow to a height of two metres after removal of all the side growths. The grape vine attains this height by the monsoons. The trunk is pinched back to a height of one metre and sixty cms. In the top-most portion, four to six buds are retained and canes from these are allowed to spread on the bamboos fixed on the "Pangara" supports. The "Pangara" tree is also pruned twice a year so as to strip it of shady branches and make it serve the purpose of a support simultaneously with enrichment of the soil with nitrogen.

In the third year, the main trunk is quite thick and fruits start appearing. Pruning is done twice—once from the middle of September to the middle of October, for obtaining a sweet crop and a second time from the middle of March to the middle of April. After the produce is harvested, in October, the canes are cut back to three to four buds. The buds nearest the main trunk generally remain dormant but the others sprout and develop into fruiting branches which bear in the dry whether, a crop in bunches at the base regions. In April after the produce is harvested, the fruited branch is cut back to the first dormant bud retained close to the trunk. This is called the foundation spur and may contain another bud in a compressed form. This grows and produces the crop in the monsoon but the grapes are sour. In October the following year, the branches that produced the sour fruit in the rainy season are pruned to three to four buds. These grow and produce a sweet crop in March and April.

Manuring

For vines in the full bearing apply 15 kgs of farmyard manure in December. Then in January put in a mixture of 2 kgs of ammonium sulphate, 1 kg of dia-ammonium phosphate and 1 kg of potash to each vine, one or two days after pruning. The application of one kg of ammonium sulphate per vine should be made after the fruits set, if the general health of the plant does not appear to be very good. All weeds are to be kept down by cultivation and hoeing. Two hundred and twenty eight grams of fertilizer applied in a ring at a distance of 60 cms from the trunk at a time when the vines are in the bearing or by dusting on the soil around the plant in a ring and flooding the area with water thoroughly when the vines have started putting forth new growth in spring, accelerate growth and result in greater production.

For the young vines which have not borne any fruit, one basketful of farmyard manure per vine should be applied in December. The rate of application of fertilizer varies from 76 grams to 114 grams per vine in the same manner as described for bearing vines.

Grown in a half-cut asphalt drum and placed on the roof along the wall and trained along it with supports, the vine can be a good choice for roof gardening.

Promising varieties for home gardens or far growing on a commercial scale are "Bokhari'", "Phakdi", "Gulabi", "Kandhari" and "Kali Sahebi" for Bombay and Deccan; "Bangalore Purple" for Mysore; "Anab-e-Shahi" for Hyderabad; "Pacha-draksha" for Tamil Nadu and "Dakh", "Bedana", "Khalili", "Fosters' Seedling", "Black Prince". "Kandhari" and "Pusa Seedless" for Punjab and the plains of North India.

Anab-e-Shahi

Hyderabad is the city of home-vineyards, bearing in profusion bunches of large oval-shaped berries which ripen in March. The variety grown is "Anab-e-Shahi" and its cultivation, as a home-garden plant, is more or less the housewife's hobby.

"Anab-e-Shahi" flurishes in the red sandy soils of Telengana. The berries are thin-skinned. Propagation is by cuttings which should be placed in nursery beds about 15 cms apart in rows also 15 cms apart. Each cutting should be of the thickness of a pencil, having three to four buds. It should be buried with one bud in the ground and two buds above ground. Cuttings should be planted during October and transplanted at the required sites in January, after they have developed three or four leaves. Vines do not shed leaves at any time of the season in Hyderabad and as such the plants are always to be lifted with their balls of earth intact.

Pits for the plants should be one metre deep and one metre in diameter. These should be filled with a mixture comprising equal parts of red earth or tank silt and well-rotted and sieved farmyard manure. The newly-planted vine should be provided with supports. Training and pruning are two factors which affect yields. Shoots on all sides should be removed allowing a clear height of two metres for the main stem. When the central leader attains this height, the growing point should be clipped and allowed to branch off. On these limbs, canes are allowed to develop 45 cms to 60 cms apart. These canes produce the fruiting shoots.

Pruning should start after the vine is about two years old. Pruning should be done in April and again in October. The April pruning aims at the removal of shoots on the canes, keeping only one bud. This results in the production of partial fruiting during the rainy season. The quality of fruit in this season is poor. Berries are sour. The main crop is available in February and March and, consequently, October pruning is very important. The soil is dug up to a depth of 45 cms in a radius of about a metre around the trunk and about 22.5 cms away from it. Root exposure is done for a week and watering is stopped during this period. A mixture comprising four baskets of farmyard manure, 1.35 to 2.25 kilos of fish meal, the same quantity of groundnut cake or castor cake, 3.60 to 5.50 kilos of bone meal and 4.5 kgs of ammonium sulphate, mixed with half a cartload of fresh red earth, is to be evenly spread over the exposed root area. Plants should be watered after refilling the pits.

Pruning should be done the next day. The canes on the shoots should be allowed to retain only three to five buds each. Watering should be stopped three weeks prior to the pruning in October. This ensures a good yield of fruit. Irrigation should be reduced as the berries start ripening. Each vine will produce 100 to 150 bunches and start bearing fruit in its third year.

Spraying with Bordeaux mixture during the monsoon and from September to December saves the vineyards from anthracnose and mildew.

Fig

The "Fig", a deciduous fruit is ideally suited to plantation in sub-tropical areas as in Pune and Bombay. A deep-rooted plant it relishes a deep-well-drained and richly-manured soil ranging in texture from light sandy loams to clayey soils and with a porous sub-soil. It can grow even in 60 cms to a metre of soil. Slightly alkaline soils are helpful for the development of a high, rich, sugar content in the fruit. A high percentage of alkalinity, however is harmful especially to foliage, the tops of which are likely to burn and fall.

Frost is harmful. Heavy damage is caused to the tree if the temperature at the time when the tree is putting forth new growth goes down below 40° F. A high temperature with no rain during the fruit-ripening stage and low humidity are essential for "fig" cultivation. Propagation is by 20-cm long and about 12 mm to 18 mm in diameter cuttings taken from one-year-old mature terminal wood or two-year-old mature wood from any other part of the tree.

In North India cuttings should be prepared in January and February during the leaf fall and tied in bundles which should be embedded in moist soil till the formation of callous. In spring, these may be planted in the nursery in a shady place about 30 cms apart in rows between 45 cms and 60 cms apart. In, Pune and Bombay, buttings should be planted in June before rains set in. The leaves should be removed as the trees in these regions do not shed leaves. With regular irrigations of cuttings, all of them will sprout. The cuttings can be transplanted at the required sites, in North Indian plains in spring without balls of earth as they will be dormant. Planting of cuttings will be in July and August in Western India and in August and September in South India. A prolific crop will be available after three years in the months, May to July in North India and March to May in Western India. In South India there will be a first crop from July to September and a second crop from February to May.

Training

The "fig" is a very quick-growing plant attaining a height of about two metres in one year. Pruning and training are necessary to maintain the health and form of the plant. In the first year of growth, therefore, the lateral shoots should be removed from the lower portion of the main stem. The main stem which is, retained should be provided with bamboo stakes for support.

When the plant grows about two metres high it should be headed back to a height of 1.2 metres from ground level. About half a dozen well-grown and properly-spaced branches should be retained 45 cms below the point where the plant was headed back, so as to give the plant a strong framework and an open centre able to get the sun and air easily. All new shoots on the main stem and the branches which are retained should be removed. Thereafter, the fruit-bearing shoots should be allowed to rise from the terminal and middle portions of the main stem and the branches. Such a heading back is necessary every year.

Some "figs" throw out long upright branches at the top. These, if allowed to remain, bend with a heavy fruit crop. Branches are likely to crack and break and suffer from sunburn also. In such cases, these upright branches may be shortened to 45 cms every year so as to give a proper framework to the tree. Where the "fig" yields two crops on the old wood (previous year's wood) as well as on the current season's growth, pruning has to be done in a manner as to retain the old wood as well as encourage the formation of new growth for ensuring a good crop.

Annual pruning comprises cutting back of the top portions of the previous year's growth which have borne the fruit. This should be done in July in Western India and in January and February in North India. In Mysore, a bush form is given to the "fig". In the months of January and February, the main stem is cut back, a year after planting, to 7.5 cms to 10 cms from group level and about half-a-dozen branches are allowed to grow up from below the point headed back, allowing branches to emerge even from below the ground level. The "fig" needs only frequent irrigation.

In North India, the "fig" enters dormancy in December and regains activity in February if it is warm or in March. During the period of dormancy, the "fig" is not susceptible to damage up to temperatures below 10° F. In Western India, the "fig" enters the period of dormancy during the monsoon i.e., August to September, and with the warming up of the season in October, new growth is put forth luxuriantly, but again, it is retarded after December. The fruit is available from March to May.

"Fig" Varieties

Edible figs are classified as follows :

Smyrna : In this variety, the fruits that develop after pollination contain seeds and those developing without pollination drop prematurely.

Common Fig

Adriatic Fig: In this, the fruit develops even without pollination. No seeds are produced.

White San Pedro

In edible "figs" the plant produces female flowers only whereas in the wild or "Caprifig" type both male and female flowers are borne. Thus for the cultivation of edible "figs", the presence of an adequate number of wild "fig" plants is necessary for pollination. For the cultivation of "Smyrna" type "figs", a few plants of "Capri fig" or wild "figs" are necessary for the supply of pollen. A hundred trees need the presence of four to six "Caprifig" trees. Each plant produces 60 to 90 fruits.

In South India the variety "Marseilles" is grown at elevations up to 1525 metres producing pale green fruit having whitish flesh which is rich in sugar.

Notching is usually practised under Bombay and Poona conditions, in July, in order to stimulate the dormant buds. At a distance of not more than 6.25 mm from the dormant bud and above it, a 2.5 cm long and 2.5 mm to 6.25 mm wide slanting cut (depending upon the thickness of the branch) is made in the bark on either side. That piece of the bark is then removed. Within three to four days of the notching, the buds will sprout and the branches will grow, shed off their leaves, enter the leaf fall period in August and September and put forth new growth again in October producing fruit by March.

An old "fig" tree can be rejuvenated by cutting back the main branches to short stubs and encouraging the sprouting of suckers which will form the new framework of the tree. A fig has a wonderful adaptation. It is capable of standing a winter temperature of 15-20° F and a summer temperature of 110-115° F.

Papaya & Carica (Passifloraceae)

The "Papaya", a tropical plant, relishes a rich loamy well-drained soil and a sunny location. Being highly susceptible to frost its cultivation is unsuccessful in very cold regions.

Generally male and female flowers are borne on separate plants. The presence of one male plant for about 10 females for pollination purposes is therefore essential. Plants which bear flowers possessing both male and female parts are also met with and they require no cross-pollination.

Pits are to be dug up one metre deep and one metre in diameter. The soil is prepared as in the case of banana. The "Papaya" is propagated from seeds sown in seed beds 15 cms apart and 1.2 cms deep in March in tropical areas and, earlier, in sub-tropical regions. Seeds are also sown in pots. The seeds germinate in about three weeks. The seedlings should then be separated and planted 22.5 cms apart when they grow to a height of 7.5 cms to 10 cms. Then the seedlings should be lifted and planted at site when grown to a height of 22.5 cms to 30 cms with the inception of rains in tropical areas and in the month of February and March in sub-tropical regions. The distance between plants should be two and a half to three metres.

As 80 per cent of the saplings grown from seeds turn out to be male it is advisable to plant three saplings at one point so as to keep one female at every pit. The one male plant is sufficient for pollinating 10 plants and the rest of the males should be cut off at ground level. Manuring after planting is to be repeated as in the case of banana. Water should not be allowed to stand near the roots of the plant for long.

The "Papaya" starts bearing flowers within six months of planting the seedlings and the fruit ripens within another six months. The plant produces a bumper crop of good quality fruit for two years at least. It should then be replaced by a new sapling.

Promising Varieties

The "Papaya" varieties yielding excellent results are "Washington", "Coorg Honey Dew" and "Saharanpur Selection" for North and South India, in addition "Long Round" and "Coimbatore" for the South; "Washington", "Gujarati" and "Coorg Honey Dew" for Western India and "Washington", "Coorg Honey Dew", "Ranchi", "Ceylonese Round" and "South African" for the East India plains.

"Phalsa" Grewia Asiatica (Tiliaceae)

The "Phalsa", a pea-sized fruit of the summer season is eaten fresh or used in the making of syrup and juice. It is indigenous to India and is botanically known as *Grewia asiatica*. So hardy is it that is grows with ease in the hot and dry climate of the North Indian plains, along the coastal strips and in the humid and warmer regions.

A rich loamy soil suits it best although it will grow well in an ordinary soil and in soils varying in texture from sandy to clayey loam. Propagation is by seed to be sown in the rains, after extracting them from the ripe fruit in summer. Seeds are to be sown five cms apart in rows to be spaced about 20 cms. from one another. Seedlings should be transplanted at site about three metres apart, preferably in February and without balls of earth. Thereafter, the roots go deeper. The "Phalsa" being a deep-rooted fruit plant, transplanting if done in the rains causes difficulty because of damage done to the roots during the process of lifting of the seedlings. However, transplantation can be done in the rainy season and July and August by lifting the seedlings with the balls of earth intact. Although drought-resistant the plant will yield fruit depending upon rain water only. If irrigation is done once in two weeks in summer and once in four weeks in winter it will yield excellent results. The fruit is borne in clusters on the new growth during summer.

"Phalsa" is deciduous in plains of North India but sheds its leaves slowly in regions of mild winter. In East India, the branches are cut back to lengths of 30 cms. after fruiting. In North India the bush is headed back in the middle of January to a height of about one metre from the ground level so as to avoid damage to the new growth, if pruning is done earlier. About 11.2 kgs of well-decomposed farmyard manure should be applied around the tree in a radius of about 60 cms. to 90 cms. after the pruning.

Pear (Fam Rosaceae)

The European "Pear" botanically known as "*Pyrus communis*", loves a deep loamy well-drained soil. The tree is large with leaf spurs looking like thorns; white flowers and fruit tapers at both ends. The planting distance should be four to five metres for varieties budded on "Quince". The planting distance is more for varieties budded on the "Wild Pear". The duration of bearing fruit is 25 years to 30 years.

Propagation is by "Shield" budding on to the rootstock of "Wild Pear" ("*Pyrus pashia*"). For producing dwarf trees the rootstock used is "Quince". Transplanting of one-year-old plants should be done during the autumn. For training into a pyramidal form the one-year-old plant should be headed back to a height of nearly 90 cms. from the ground level. If any vigorous laterals are present on the central stem, after the plant is headed back these should be cut back to 10 cms. Pruning should be done after the frost season but before the buds begin to swell. When the tree is in its second year, five or six scaffolds should be left for the future framework of the tree. These should bo pruned to 30 cms to 45 cms keeping the central stem about five cms taller than the others. In the third year the central leader is not cut back but all the branches rising from the central trunk and the laterals should be cut back to five to six leaves. In the fourth year, during winter, the central trunk is headed back to one third of its height. Fruiting will start in the fourth year.

In the young bearing trees pruning should be light. Cutting back a-year-old or older branches is necessary, allowing at the same time, for the central leader to grow several cms longer than the others. Overpruning is more harmful than non-pruning and, therefore, the trees in the bearing age require careful handling.

The varieties recommended for good growth are "Bagu Gosha", "Thompsons". "Williams Bon Chritien", "Easter Beurra" and "Winter Nelis". For the plains of North India, "Nashpati" is good. It has a gritty pulp.

Trimming of mature-bearing trees is essential. Branches crossing one another or running closely parallel; branches causing heavy shade, especially on the fruiting branches; branches closer to the ground than the optimum height; diseased, worn-out, dead, broken, weak wood and water suckers require removal. A "Pear" tree should never be kept crowded as such conditions make it easily susceptible to blight. Branches growing out of proportion to the laterals of trees, more than one year old, need to be shortened. A-year-old growth may be cut back to the point of a bud, protruding outside, so as to provide an open head to the tree. The loose bark should also be removed so as to prevent moth and other insects hiding themselves underneath the bark. The lowest branch should not be at a height of less than 45 cms. from the ground. The less vigorous trees require severe pruning.

Peach (Prunus Persica) (Rosaceae)

Good varieties of "Peach" can be successfully grown at different elevations in hilly areas. The "Peach" is eaten fresh or canned.

The "Peach" botanically named *Prunus Persica* (*Persica vulgaris, Amygdalus persica*) relishes a sandy loam. The country varieties are easily propagated by cuttings but the commercial varieties are propagated by budding on to seedlings of "Peach" rootstocks or almond seedlings. For preparing "Peach" rootstocks, sow seeds of "Peach" in October. These will germinate in January or February. It is a practice at some places to sow "Peach" seeds in moist sand from where, in January, the seedlings are planted elsewhere and allowed to remain there till used for budding purposes.

Budding of the choicest varieties of "Peach" can be done on to the seedlings of "Peach" or almond during April and Mayor in September. "Peach" trees should always be transplanted at permanent sites when one-year-old, although two-year-old trees can also be transplanted. Planting should be done during autumn or early spring when the trees are dormant and leafless. Transplanting at this time will enable the roots to establish themselves. The trunks of the plants may be given a coating of white-wash, immediately after planting, in order to provide protection against sun-burn. The plant will grow vigorously. It is advisable to train the newly-planted trees in such a manner as to have low-head trees which may branch within 45 cms to 55 cms from the ground. The newly planted trees should be headed back at a height of 45 cms. The main branches should be well spaced with no branch being at a height of more than 30 cms from ground level. The other side-growths should be removed. When the leaves are shed in the first year and the plant enters the period of dormancy, the laterals, i.e. the main branches should be cut to 15 cms in length with two well-spaced secondary branches on each main branch being retained. In the case of the two-year-old trees, the heading back should be done at a height of 55 cms, leaving three to four scaffolds, 10 cms apart and at an angle of 90 degrees with the trunk, if possible.

The planting distance should be from five to seven metres. Cultivation is necessary in order to suppress weed growth. The "Peach" tree should be pruned in the non-bearing stage as well as in the bearing stage. It starts bearing fruit in its third or fourth year. "Peaches" are always borne on lateral buds formed on the previous year's growth. Buds are borne in groups of three, the central bud being the leaf bud and the two side-buds being the fruit buds, each producing a flower. The principle involved in pruning is to have sufficient fruiting wood every year.

This makes cutting back a necessary practice every year. Pruning should start after the frost period is over.

Remove all dry, dead, diseased and broken branches. Thin out weak, crossing and parallel branches so as to keep the centre open. Fruit thinning is also practised for developing properly-sized and quality fruit after the occurrence of the natural drop in May and June. Depending on the varieties, fruit is kept 7.5 cms to 12 cms apart after thinning. Fruit should be harvested when mature.

Peach Varieties

Amongst self-pollinating commercial "Peach" varieties which should find a place in a hill home garden, are "Peregrine", "Duke of York", "Early Beatrica", "Late Devonian" and "Alexander". The variety "J. H. Hale" is not self-pollinating.

Plum (Prunus Pomestica) (Rosaceae)

The cultivation of the "Plum" is similar to that of the "Peach". It is propagated by "Shield" budding on to the stock of wild "Apricot" ("zardalu") and, to some extent, on "Peach". Spacing may be done five metres apart. The varieties ideal for the hilly areas are "Beauty" '(Japanese), "Grand Duke", "Santa Rosa" (Japanese) "Victoria", "Bright Red" and "Barbank". Hardy varieties are suitable for the plains. "Plums" of European origin belong to the genus *Prunus domestica* and those of Japanese origin to *Prunus salicina.* Fruit production in the Japanese varieties is more than in the Western varieties. Consequently, the former requires severe pruning and the latter a light one.

The "Plum" bears white flowers in abundance and the fruit shows variation in colour. The usual colour is blue-purple. *Prunus domestica* grows to a height of 10 metres or more, with flowers of white or cream colour. In *Prunus salicina*, the tree is small the flowers are white and the fruit is yellow or light red. Fruit thinning may be carried out for the regulation of crop production.

When a "Plum" tree is planted in February, the main stem should be headed back to a height of about 60 cms. When growth starts, it is advisable to retain three to five branches at proper distances in a spiral form around the main stem. Remove the remaining growth. During the first winter pruning is of paramount importance. The operation consists of heading back the main branches with a view to enabling the plant to put forth secondary branches. The main stem, with an adequate number of well-spaced branches as also the secondary branches is retained. The other growth is removed. In the second winter and subsequent years, pruning aims at the removal of crossing branches and superfluous growth. The branches growing upwards are pruned to the point of outside buds to encourage the formation of an open head system. Generally, the lighter the pruning, the more promising are the results.

Banana : Plantain (Musaceae)

The "Banana", a tropical plant, relishes a humid, warm atmosphere-and heavy rains. It is an annual fruit plant bearing fruit for one year only. Thereafter, it should be cut to ground level and new suckers allowed to grow. A deep rich well-drained loamy soil, retentive of moisture, but free from water logging and with the presence of a large quantity of organic matter present, is the best for "Banana" cultivation. The plant needs large quantities of water, calcareous, heavy and clayey. Stony soils and soils which are shallower than 45 cms. in depth are unsuitable for "Bananas". The soil should be prepared by digging it to a depth of 60 cms. to 90 cms. and allowing it to remain exposed to the sun for a month or so. It should be refilled after mixing with a liberal quantity of well-rotted farm-yard manure.

Propagation of the "Banana" is by suckers which rise around the mother plant in large numbers. Two types of suckers are met with in "Bananas" ; the type with pointed leaves called the "Sword suckers" and the other with broad foliage known as "Water Suckers". It is the "Sword Sucker" which produces vigorous and early-fruiting plants. Suckers, 60 cms to 90 cms high, should be planted about two metres apart. The best time for planting of suckers starts with the first shower of rain in North India, West India, Karnataka, Andhra Pradesh, Orissa and the regions of reasonable rainfall such as West Bengal, Bihar and Assam. This will enable the plants to fully avail of the three to four months of rains, establish themselves and grow before the winter approaches. In winter the growth is retarded or comes to a standstill. In regions of heavy rainfall in South India and Kerala, planting should be done from September to October and in regions of heavy rainfall in West Bengal, with the onset of the south-west monsoon and at a time when rains are not too heavy. April is the best planting month on hilly slopes.

Being a heavy feeder, the "Banana" requires liberal watering and rich manuring. One basketful of well-rotted cowdung manure should be applied to each plant on the appearance of flowers and another application when the fruit appears. Application of nitrogenous manure, i.e. ammonium sulphate or oil cake, as a top dressing to each plant three months after planting but before the plant attains the age of six months, is highly helpful. Irrigation throughout the year, except during the period when the rains are consistent, is very necessary. More watering is needed during summer than during rains. In summer watering is required after every three days, in winter after a week and after every 10 days if

Jasminoides

Tecoma Grandiflora

Marechal

Passiflora

Camellia Japonica

Spiraea Corymbosa

Gardenia

Cestrum Purpureum

the rains are scanty. The "Banana" produces fruit within 12 to 15 months and, in some cases, 18 months after the planting of suckers, depending upon the plant varieties. Thereafter it dies and fresh plantations can be made by cultivating new suckers.

Over sixty varieties of "Banana" are in cultivation, and out of these 12 are of commercial importance. Given below are some of the varieties of "Bananas" suitable for various regions.

"Basrai Dwarf"

It is grown in Bombay and Pune. It is known as "Kabuli" in West Bengal and Orissa and "Vamankeli" in South India. The plant grows to a height varying from a metre and a half to two metres. The fruit is sweet with a soft pulp and with a skin of a dull yellow or greenish colour. This variety is a prolific bearer, producing fruit in clusters, each cluster having 100-120 fruit.

Harichail

This variety is also known as "Bombay Green". It grows to a height of three to four metres. It has a sweet pulp and the skin is more greenish when the fruit is ripe. Each bunch has 150-160 fruit.

"Poova": Known as "Poovan" in South India, "Champs" in Bengal, and "Lal Velchi" in Bombay this variety is yellow-skinned. The pulp is sweet having a slightly sour taste which is very much relished by children. The plant grows tall but the fruit is small. There are 200 fruit in a single bunch.

Other promising varieties are "Safed Velchi" of Bombay, also known as "Chen Kadali" in South India; "Tella Chakkrakeli" of South India; "Monthan" of South India, also known as "Kanchkela" in Bengal and "Khasadia" or "Bankel" in Maharashtra; the "Nendrans" of South India and "Lal Kela" or "Red Banana" known as "Chen Kadali" in South India.

Hill Bananas

"Bananas" are grown successfully at altitudes varying from 700 to 1700 metres in South India. The lower hill slopes of the Nilgiris and the hills of the Maharashtra Karnatak area are suitable spots. The most promising varieties are "Virupakshi" and "Sirumalai" of South India and "Rajpuri" of the Maharashtra Karnatak area.

XVIII
Chrysanthemums

THE GARDEN in late autumn owes much of its charm to the freedom with which chrysanthemums bloom.

Chrysanthemum is a flower of the aster family with large heads of showy flowers. The Japanese, with their great admiration for this flower, produce the most popular varieties with large handsome blooms. A good show bloom varies from 18 cm. to 26 cm. across and the same in depth, according to the variety.

The flower is held in high esteem by the Chinese as well. The incurred type of Chinese chrysanthemums and the loosely-incurring Japanese type are quite famous.

A chrysanthemum flower consists of two kinds of florets, one forming a cushion at the centre of the bloom, known as disk florets, and the other which forms the peripheral border known as ray florets.

There are six main groups of chrysanthemums.

Incurved. These bloom with close, firm and regularly incurved florets which form a perfect globe. Examples: Advance (deep yellow), White Empress (silvery white), Calypso (reddish to bronze), Frank Tristan (amber) and Butter-cup (deep yellow).

Reflexed. These bloom with outer florets reflexed and inner florets incurving. Examples: Birmingham (large-exhibition), Edith Alston (reflexed-decorative), Roselandia (medium-flowered) and Barbara (large-flowered).

Incurving. These bloom with florets frequently incurving loosely and irregularly. Example: Candeur (large-exhibition), Coralie (incurving-decorative), Bronze Mcleod (large-flowered) and Bull furch (medium-flowered).

Anemone Flowered. These bloom with tubular disk florets forming a central cushion. The bloom is single. Example: Approdite (mauve pink), Marry Godfrey (pink), Thora (rose pink) and Winsome (crimson).

Pompons. Developed from the chusan daisy the blooms are very small. Examples: Billie Burke (golden orange), Ethel (red), Hilda Canning (bronze) and Nema (white).

Singles. The bloom having not more than five rows of ray florets and a central disk is known as the 'daisy eye'. This variety includes all varieties other than the Anemone flowered type. Examples: Golden Mensa (crimson), Phyllis Cooper (orange) and Postia (red).

In the Cascade type, the Chrysanthemums produce long trailing plants developing a cascade of bloom, thus looking just bewitching.

Chrysanthemums do not do well in a sticky soil. A compost made of rotted leaf mould, powdered charcoal and sand in the ratio of 7: 3 : 1 is ideal for the culture of chrysanthemums. To this may be added some bone meal. A top dressing with sand is very essential to avert the danger of 'damping off'.

Cuttings can be put in such a soil. Cuttings should be prepared from the side shoots springing up after the main stem is cut to ground level after the blooming period is over. Five to eight cm. long cuttings which are cut immediately below the joint are the best to be planted. These may be planted in 7 cm. pots four to each pot and one to each for exhibition blooms from February to March. It will take three weeks for the cuttings to take root and in May the plants will grow so high needing to be transferred to 15 cm pots. During the rainy season in August, the plants are taken in 13 cm pots from where they are transferred to 30 cm pots in October. These plants should be allowed to remain in these pots till the flowering period is over.

The growth from July to September is very active. The plants must be properly supported as the stems of chrysanthemum plants are brittle. A bamboo cane a metre in length for each plant is sufficient. The first loop should be round the cane first and then round the main stem. The second loop should also be taken round the cane first and then loosely round the laterals.

Manuring

The plants should be fed 2-3 times a week alternatively with sulphate of potash and weak manure-water, during the flowering period. There should be no frequent feeding after the buds are half open. Feeding is to be totally stopped after the buds are three parts open. If the plants look sickly, during the flowering period, powdered charcoal must be added to the soil or else the plant should be transferred to another pot with an extra addition of powdered charcoal and sand.

In the hot season plants are to be watered all over the leaves while during the flowering period watering is to be done at the roots. Over-watering is to be avoided.

In the event of rainy weather being prolonged it is advisable to lay the pots in the sides for a few days.

Great skill is required in getting the required type of flowers at the required time. To get flowers in November it is essential that the plants should form buds in August and for that stopping is to be done in June. The single stemmed plant is made to produce two or three laterals by pinching off the growing point. The laterals are allowed to grow unchecked so as to produce buds which are called ‘first crown buds’.

Keep one bud per stem and remove the other buds. The flowers shall be fine in sequence. The procedure in vogue for getting exhibition flowers is to allow one flower per stem.

Some varieties produce finer blooms with second crown buds. To obtain them, stopping is to be exercised first in April and again in June. A plant with 6-9 flowers on it is recognised as the best in this case. If the second crown buds are taken off, the next and the final buds are terminal ones.

When chrysanthemums are grown for mass effects, all the buds are to be retained. After the flowering period is over the stem is to be cut back to ground level and the cultural routine followed as outlined above.

XIX
Orchids

A COUPLE OF hundred years ago, orchids were nowhere near their present popularity. Europe had barely heard of a few species. It was only towards the latter part of the 19th century that orchids became a craze and hundreds of hybrid varieties were cultivated all over the world.

Orchids constitute more than 600 genera and about 20,000 species of perennial herbs which are spread the world over. They are not a success only in the great deserts and polar regions. In India their cultivation in recent years has virtually become a craze.

The Himalayan region is rich in these delicate flowering plants. Our forests have many interesting varieties of wild orchids. There, one comes across these exquisite blossoms growing in mossy rock crevices and on tree-trunks and branches. They grow especially in places that provide humidity, warmth and shade.

Tropical and sub-tropical areas, too, abound in a superb range of orchids. Actually, 80 to 85 per cent of the species grow in these regions and only 15 to 20 per cent in the temperate areas. With reference to their habitat, orchids are categorised as "Terrestrial", popularly known as "Ground Orchids", "Saprophytic", "Epiphytic" and "Semi-epiphytic"—there being hardly any true parasitic types. Most of the species originating in the tropical world are "Epiphytic" and those which are from the temperate regions are "Terrestrials".

Not Parasites

Terrestrial orchids are grown on the ground or in pots or other receptacles including baskets. They are mostly green plants which, by a process of photosynthesis, get their food for subsistence from the carbon dioxide in the air. There are types which are completely devoid of chlorophyll; in others, chlorophyll is present in such minute traces as to make it impossible for the plants to manufacture food from atmospheric carbon dioxide by photosynthesis. The requirements of carbon food are met with from the organic matter of the humus and not from the trees. Even when grown on trees humus needs to be made available to orchids. Called Saprophytes, these plants are not true parasites in any way. Actually, according to Baiely, "The parasites are not known among the Orchids."

Saprophytic orchids characteristically have either an underground rhizome that looks like a much-branched and notted coral, as in Corallorhiza and Epipogon, but without any true roots or the rootstock or has numerous fleshy roots as in Neottia. They are a rare lot, living on deadwood. Though extremely difficult to maintain as cultivated plants, there are some exquisite types and forms of Saprophytes.

The ideal soil for growing Terrestrial orchids consists of fully-decayed coarse leaf mould, peat, small pieces of bricks, of the size of pea to walnut, and charcoal. The soil should be well drained. For planting in pots, pans and boxes fill one-third of the pot with clean and well-washed crocks and brickbats, put a layer of moss or coconut fibre over these, put the plant on the compost, making it firm with pieces of charcoal and brickbats, and then provide a dressing of moss and peat. Never immerse the pseudo-bulbs in the compost as this may lead to plant casualty. In no case should the crown of the plant be covered with soil.

Epiphytics

Epiphytics, which are mostly of tropical origin, usually grow on the branches of trees. Though their roots are exposed to the air they draw their nourishment from the atmosphere. Epiphytic orchids are grown in a bed of moss only. No manure or chemical fertilizers are used.

Epiphytic orchids are often grown in undersized pots and also on logs, like those of the mango, which have a rough bark, but are completely disease-free. They can also be grown on slabs of teakwood.

First place some moss on a log of wood, then place the plant on it, spreading out the roots, putting more moss on the roots, keeping the plant in position by wrapping it with a strong thread, taking the string round over the moss and keeping the moss moist but not wet. The plant will develop aerial roots in course of time.

Semi-epiphytics are those which send roots to the ground, but develop aerial and adventitious roots as well. Roots sent to the ground draw some nourishment from the earth. The aerial and adventitious roots cling to the trees for support, but draw their nourishment by absorbing moisture and food from the atmosphere.

Propagation

The best time for growing orchids is in February. Propagation by seed is a time-consuming process-in some cases it is years before the plants start flowering. Orchids are therefore generally grown from division of clumps of pseudo-bulbs or stems after the flowering. Some are multiplied by dividing the pseudo-bulbs in pieces—each piece having undamaged roots attached to it. These pieces are put in small pots and not watered till growth starts.

Some like Renanthera, Aerides and Saccolabium, are grown from cuttings. Each cutting, in such cases, should have a few aerial roots for its sustenance until the plant becomes established. Till the cuttings establish themselves, the lower ends of the cuttings have to be kept moist with moss wrapped around them.

According to some experts, for hardier terrestrial orchids, for pot culture, a compost containing sand, red earth, leaf mould and well-rotted cow manure, in equal proportions, is ideal in the southern regions of India.

Osmunda fibre, which is derived from *Osmunda claytoniana* and *Osmunda cinamomea*, is an excellent fibre for growing orchids. Fibrous peat, however, is equally good.

As a rule, any fibre which has an acidity of about pH^5 and is not likely to rot soon is good for growing orchids. Sphagnum moss is also added in some cases with a view to regulating the moisture holding capacity of the mixture. Where fibrous peat or Osmunda fibre are not available, coconut fibre can be used.

The general compost soil good for orchids is peat moss (4 parts), brick pieces (2 parts), charcoal (1 part), light tank silt (1 part) and leaf mould (l part).

The best potting or reporting time under Indian conditions is the period immediately after the flowering is over. Of course, any plant which looks sickly or is not doing well should be re-potted immediately, irrespective of season.

Three Stages

There are three distinct stages observed in the life-history of an orchids: (a) the growing period in the rainy season, when food and water are stored in their pseudo-bulbs; (b) the rest period, which for most types of orchids extends from November to March, during which period the plants remain dormant and ripen, and (c) the most eagerly-looked-forward-to stage, when the orchids just burst into flowers.

There are orchids which shed leaves during the rest period and there are others which remain green. The former require no watering till new growth starts and in the latter watering has to be kept to the barest minimum during the rest period and only to the extent of keeping the plant alive.

It is during the rest period, in February, that orchids are fit to be transported for the purpose of planting. If on arrival the plants show signs of decay, the decayed portions should be trimmed and the plant allowed to rest in a cool place. Those with pseudo-bulbs are sponged and those with roots are dipped in water for five minutes a day till growth starts. At this stage they can be potted.

XX

Dahlia

THE DAHLIA (Farm: -*Compositae*) is a native of Mexico and the genus of over a dozen species of strong, usually erect, herbaceous plants with tuberous roots. The *Dahlia*, popularly known as "the King of Flowers," was introduced to the Botanical Garden, Madrid, in 1789. From Spain, three varieties, *Dahlia Pinnate* bearing double purple flowers, *Dahlia Roses* producing single rose flowers and *Dahlia Coccinea* having single red flowers, were taken to the Kew Garden in the UK in 1789 and to France in 1802. All these varieties were lost. The plants, from which early garden *Dahlias* were derived owe their origin to seeds sent from Madrid in 1804. Numerous varieties have now been raised particularly in France, the UK., Germany, Holland and the U.S.A.

Classification :

Dahlias are divided into several classes and sub-classes according to the National Dahlia Society and the Royal Horticultural Society, London.

Class I

(a) *Show Singles* : The ray florets are smooth and slightly recurved at tips and form a globular flower by over-lapping. The flower heads do not exceed 7.5 cms across.

(b) *Singles* : The tips of the ray florets are separated and the overlapping of these rays is not complete as in (a) above.

(c) *Mignon* : The flower heads are similar to that in (b) above. Plants do not exceed 45 cms in height.

Class II

Anemone Flowered Dahlias : The ray florets are present in one or more series. There is a dense group of disc florets, longer than the ones found in Class I. Disc florets are tubular in shape and of a different colour from the ray florets.

Class III

Collarette Dahlias : The flower heads have one or more series of flat ray florets. A ring of florets, of half the length of rays, is present above each series and is of a different colour from the rays. This ring of florets is called a *collarette*.

(a) *Collarette Singles* : The flower heads have a single series of ray florets and one *collarette* with a yellow disc.

(b) *Collarette Paeony Flowered* : The flower heads have two or three series of rays and a yellow disc.

(c) *Collarette Decorative* : As in *collareate* Paeony but fully double.

Class IV

Paeony Flowered Dahlias : The flower heads have two or three series of ray florets and a central cushion of disc florets.

(a) *Large Paeony Flowered* : The flower heads are over 18 cms across.

(b) *Medium Paeony Flowered* : The flower heads are from 13 cms to 18 cms across.

(c) *Small Paeony Flowered* : The flower heads are less than 13 cms across.

(d) *Dwarf Paeony Flowered* : The plants are not more than 75 cms high.

Class V

Formal Decorative Dahlias : The flower heads are fully double showing no disc. All florets are regularly arranged. The margins of these are slightly incurved and flattened towards the broadly-pointed or rounded tips. The sub-classes are as in Class IV.

Class VI

Informal Decorative Dahlias : The flower heads fully double show no disc as in Class V but the ray florets are not regularly arranged. They are broad, nearly flat, slightly twisted and acutely pointed. There are four sub-classes corresponding to those mentioned under Class IV.

Class VII

Show Dahlias : The flower heads are fully double, over 7.5 cms across, almost globular and the central florets resemble the outer ones but are comparatively smaller in size. The margins of the florets are incurred, tubular or cup-shaped, short and blunt at the mouth.

Class VIII

Pompon Dahlias : The flower heads are smaller than in Show Dahlias. Flower heads not exceeding five cms across are ideal for show purposes.

Class IX

Cactus Dahlias : The central florets form a filbert-shaped group. The flower heads are fully double with the margin of the flowers revolute for three quarters of their length.

Class X

Semi Cactus Dahlias : The flower heads are fully double with the florets broad at the base and revolute towards the tip and twisted to a slight extent for about half of their length.

Class XI

Star Dahlias : The flower heads have two or three series of pointed ray florets, the margins of which are incurving but do not overlap, forming thereby a cup-shaped flower head with a disc.

Growth Conditions

A sunny location, sheltered from strong winds, is ideal for growing Dahlias. Generally speaking, all *Dahlias* are heavy feeders and, thus, require a deep rich soil for proper culture. Deep digging, proper exposure of the soil to the sun and liberal manuring before sowing or planting are absolutely essential. A smooth surface should be given to the bed to safeguard against the ravages of slugs and snails, which are deadly foes of *Dahlias* in the early stages of growth. Dust with soot or lime the bases of the plants frequently or dissolve four ounces of soap in a gallon of water and use this soap solution frequently to save the plants from the green fly.

Propagation is by seed, tubers or cuttings, the first two methods being common practice in India. Seeds never come true to the parent and as such are used for the evolution of new varieties. Tubers, on the other hand, come true to the parent. Seeds are sown thinly in beds in the nursery or seed pan or seed boxes from August to September and transplanted when the seedlings can be easily handled. Planting distance varies with each variety. For example, *Mignon* varieties can be planted 45 cms to 60 cms apart; strong tall varieties are planted about two metres apart. For most varieties, a distance of a metre between two plants is reasonable.

A word of caution. Buds are not present directly on the tuber, they are on the old stem. Care should be taken to take a piece of the old stem with each division of the tuber. These pieces should be planted in nursery beds or pots, covering them with sand. This is done in July. From the nursery beds the *Dahlia* tubers are transplanted *in situ* in pots, beds or borders. Flowering takes place in about four months. Seeds, sown in September give flowers in February.

Stakes for supports to *Dahlias* should be provided in the early stages as the stems are brittle. It is advisable to pinch the growing point when the plant grows 15 cms. Disbudding is practised by leaving the middle bud and removing the two next below, if the flowers are required for exhibition purposes.

For growing plants in pots, the soil should consist of two parts of fibrous loam, one part each of leaf manure and rotten compost and some coarse sand. Watering is discontinued when the flowering is over, with a view to facilitating the ripening of the tubers properly. Cut the stems down to one inch from the ground level as these decay. Eyes should be present in rings around the collar of the root. Lift the tubers so that the upper part is not damaged. Dry them properly and put them in pots covered with dry earth. These may then be stored in a godown.

Do not allow the tubers to remain exposed to the air for long as they will shrivel and perish. If the tubers are not dried properly and moisture is present, they may be attacked by a fungus called *Sclerotinia sclerotiorum*. In cases where it is difficult to dry up the thick bases thoroughly, dusting with copper should be done. Lime dust is also a good treatment for stored *Dahlias*.

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Lawns and Gardens whether to satisfy our aesthetic taste or for commercial purpose, are a unique creation. A garden is all things to all people, it may be considered a quiet corner for relaxation or entertainment or may be a proposition for profit. Whatever the purpose, harmony with environment should be the keynote of a garden.

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